CLAIMS:

1. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least one portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

controlling the heat from the one or more heat sources such that an average temperature within at least a majority of the selected section of the formation is less than about 375 °C; and

producing a mixture from the formation.

2. The method of claim 1, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some coal within the selected section of the formation.

3. The method of claim 1, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

4. The method of claim 1, wherein the one or more heat sources comprise electrical heaters.

5. The method of claim 1, wherein the one or more heat sources comprise surface burners.

6. The method of claim 1, wherein the one or more heat sources comprise flameless distributed combustors.

7. The method of claim 1, wherein the one or more heat sources comprise natural distributed combustors.

8. The method of claim 1, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

9. The method of claim 1, further comprising controlling a pressure within at least a majority of the selected section of the formation with a valve coupled to at least one of the one or more heat sources.

10. The method of claim 1, further comprising controlling a pressure within at least a majority of the selected section of the formation with a valve coupled to a production well located in the formation.

11. The method of claim 1, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

12. The method of claim 1, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity(C_v), and wherein the heating pyrolyzes at least some coal within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

13. The method of claim 1, wherein allowing the heat to transfer from the one or more heat sources to the selected section comprises transferring heat substantially by conduction.

14. The method of claim 1, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

15. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

16. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

17. The method of claim 1, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

18. The method of claim 1, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

19. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

20. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

21. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

22. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

23. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

24. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

25. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

26. The method of claim 1, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

27. The method of claim 1, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

28. The method of claim 1, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

29. The method of claim 1, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

30. The method of claim 1, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

31. The method of claim 1, further comprising controlling formation conditions such that the produced mixture comprises a partial pressure of H_2 within the mixture greater than about 0.5 bar.

32. The method of claim 31, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

33. The method of claim 1, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

34. The method of claim 1, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

35. The method of claim 1, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

36. The method of claim 1, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

37. The method of claim 1, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

38. The method of claim 1, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

39. The method of claim 1, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

40. The method of claim 1, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

41. The method of claim 1, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

42. The method of claim 1, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

43. The method of claim 1, further comprising separating the produced mixture into a gas stream and a liquid stream.

44. The method of claim 1, further comprising separating the produced mixture into a gas stream and a liquid stream and separating the liquid stream into an aqueous stream and a non-aqueous stream.

45. The method of claim 1, wherein the produced mixture comprises H_2S, the method further comprising separating a portion of the H_2S from non-condensable hydrocarbons.

46. The method of claim 1, wherein the produced mixture comprises CO_2, the method further comprising separating a portion of the CO_2 from non-condensable hydrocarbons.

47. The method of claim 1, wherein the mixture is produced from a production well, wherein the heating is controlled such that the mixture can be produced from the formation as a vapor.

48. The method of claim 1, wherein the mixture is produced from a production well, the method further comprising heating a wellbore of the production well to inhibit condensation of the mixture within the wellbore.

49. The method of claim 1, wherein the mixture is produced from a production well, wherein a wellbore of the production well comprises a heater element configured to heat the formation adjacent to the wellbore, and further comprising heating the formation with the heater element to produce the mixture, wherein the mixture comprises a large non-condensable hydrocarbon gas component and H_2.

50. The method of claim 1, wherein the minimum pyrolysis temperature is about 270 °C.

51. The method of claim 1, further comprising maintaining the pressure within the formation above about 2.0 bar absolute to inhibit production of fluids having carbon numbers above 25.

52. The method of claim 1, further comprising controlling pressure within the formation in a range from about atmospheric pressure to about 100 bar, as measured at a wellhead of a production well, to control an amount of condensable hydrocarbons within the produced mixture, wherein the pressure is reduced to increase production of condensable hydrocarbons, and wherein the pressure is increased to increase production of non-condensable hydrocarbons.

53. The method of claim 1, further comprising controlling pressure within the formation in a range from about atmospheric pressure to about 100 bar, as measured at a wellhead of a production well, to control an API gravity of condensable hydrocarbons within the produced mixture, wherein the pressure is reduced to decrease the API gravity, and wherein the pressure is increased to reduce the API gravity.

54. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from at least the portion to a selected section of the formation substantially by conduction of heat;

pyrolyzing at least some hydrocarbons within the selected section of the formation; and

producing a mixture from the formation.

55. The method of claim 54, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

56. The method of claim 54, wherein the one or more heat sources comprise electrical heaters.

57. The method of claim 54, wherein the one or more heat sources comprise surface burners.

58. The method of claim 54, wherein the one or more heat sources comprise flameless distributed combustors.

59. The method of claim 54, wherein the one or more heat sources comprise natural distributed combustors.

60. The method of claim 54, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

61. The method of claim 54, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1.0 ° C per day during pyrolysis.

62. The method of claim 54, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

63. The method of claim 54, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

64. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

65. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

66. The method of claim 54, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

67. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

68. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

69. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

70. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

71. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

72. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

73. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

74. The method of claim 54, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

75. The method of claim 54, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

76. The method of claim 54, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

77. The method of claim 54, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

78. The method of claim 54, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

79. The method of claim 54, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

80. The method of claim 79, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

81. The method of claim 54, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

82. The method of claim 54, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

83. The method of claim 54, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

84. The method of claim 54, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

85. The method of claim 54, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

86. The method of claim 54, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

87. The method of claim 54, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

88. The method of claim 54, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

89. The method of claim 54, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

90. The method of claim 54, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

91. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

92. The method of claim 91, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

93. The method of claim 91, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

94. The method of claim 91, wherein the one or more heat sources comprise electrical heaters.

95. The method of claim 91, wherein the one or more heat sources comprise surface burners.

96. The method of claim 91, wherein the one or more heat sources comprise flameless distributed combustors.

97. The method of claim 91, wherein the one or more heat sources comprise natural distributed combustors.

98. The method of claim 91, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

99. The method of claim 91, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

100. The method of claim 91, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

101. The method of claim 91, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

102. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

103. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

104. The method of claim 91, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

105. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

106. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

107. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

108. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

109. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

110. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

111. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

112. The method of claim 91, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

113. The method of claim 91, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

114. The method of claim 91, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

115. The method of claim 91, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

116. The method of claim 91, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

117. The method of claim 91, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

118. The method of claim 117, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

119. The method of claim 91, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

120. The method of claim 91, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

121. The method of claim 91, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

122. The method of claim 91, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

123. The method of claim 91, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

124. The method of claim 91, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

125. The method of claim 91, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

126. The method of claim 91, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

127. The method of claim 91, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

128. The method of claim 91, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

129. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

controlling the heat from the one or more heat sources such that an average temperature within at least a majority of the selected section of the formation is less than about 370 °C such that production of a substantial amount of hydrocarbons having carbon numbers greater than 25 is inhibited;

controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least 2.0 bar; and

producing a mixture from the formation, wherein about 0.1 % by weight of the produced mixture to about 15 % by weight of the produced mixture are olefins, and wherein an average carbon number of the produced mixture ranges from 1-25.

130. The method of claim 129, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

131. The method of claim 129, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

132. The method of claim 129, wherein the one or more heat sources comprise electrical heaters.

133. The method of claim 129, wherein the one or more heat sources comprise surface burners.

134. The method of claim 129, wherein the one or more heat sources comprise flameless distributed combustors.

135. The method of claim 129, wherein the one or more heat sources comprise natural distributed combustors.

136. The method of claim 129, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

137. The method of claim 129, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

138. The method of claim 129, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

139. The method of claim 129, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

140. The method of claim 129, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

141. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

142. The method of claim 129, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

143. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

144. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

145. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

146. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

147. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

148. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

149. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

150. The method of claim 129, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

151. The method of claim 129, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

152. The method of claim 129, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

153. The method of claim 129, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

154. The method of claim 129, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

155. The method of claim 154, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

156. The method of claim 129, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

157. The method of claim 129, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

158. The method of claim 129, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

159. The method of claim 129, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

160. The method of claim 129, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

161. The method of claim 129, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

162. The method of claim 129, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

163. The method of claim 129, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

164. The method of claim 129, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

165. The method of claim 129, further comprising separating the produced mixture into a gas stream and a liquid stream.

166. The method of claim 129, further comprising separating the produced mixture into a gas stream and a liquid stream and separating the liquid stream into an aqueous stream and a non-aqueous stream.

167. The method of claim 129, wherein the produced mixture comprises H_2S, the method further comprising separating a portion of the H_2S from non-condensable hydrocarbons.

168. The method of claim 129, wherein the produced mixture comprises CO_2, the method further comprising separating a portion of the CO_2 from non-condensable hydrocarbons.

169. The method of claim 129, wherein the mixture is produced from a production well, wherein the heating is controlled such that the mixture can be produced from the formation as a vapor.

170. The method of claim 129, wherein the mixture is produced from a production well, the method further comprising heating a wellbore of the production well to inhibit condensation of the mixture within the wellbore.

171. The method of claim 129, wherein the mixture is produced from a production well, wherein a wellbore of the production well comprises a heater element configured to heat the formation adjacent to the wellbore, and further comprising heating the formation with the heater element to produce the mixture, wherein the produced mixture comprise a large non-condensable hydrocarbon gas component and H_2.

172. The method of claim 129, wherein the minimum pyrolysis temperature is about 270 °C.

173. The method of claim 129, further comprising maintaining the pressure within the formation above about 2.0 bar absolute to inhibit production of fluids having carbon numbers above 25.

174. The method of claim 129, further comprising controlling pressure within the formation in a range from about atmospheric pressure to about 100 bar absolute, as measured at a wellhead of a production well, to control an amount of condensable fluids within the produced mixture, wherein the pressure is reduced to increase production of condensable fluids, and wherein the pressure is increased to increase production of non-condensable fluids.

175. The method of claim 129, further comprising controlling pressure within the formation in a range from about atmospheric pressure to about 100 bar absolute, as measured at a wellhead of a production well, to control an API gravity of condensable fluids within the produced mixture, wherein the pressure is reduced to decrease the API gravity, and wherein the pressure is increased to reduce the API gravity.

176. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute; and

producing a mixture from the formation.

177. The method of claim 176, wherein controlling the pressure comprises controlling the pressure with a valve coupled to at least one of the one or more heat sources.

178. The method of claim 176, wherein controlling the pressure comprises controlling the pressure with a valve coupled to a production well located in the formation.

179. The method of claim 176, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

180. The method of claim 176, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

181. The method of claim 176, wherein the one or more heat sources comprise electrical heaters.

182. The method of claim 176, wherein the one or more heat sources comprise surface burners.

183. The method of claim 176, wherein the one or more heat sources comprise flameless distributed combustors.

184. The method of claim 176, wherein the one or more heat sources comprise natural distributed combustors.

185. The method of claim 176, further comprising controlling a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

186. The method of claim 176, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

187. The method of claim 176, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

188. The method of claim 176, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

189. The method of claim 176, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

190. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

191. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

192. The method of claim 176, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

193. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

194. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

195. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

196. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

197. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

198. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

199. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

200. The method of claim 176, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

201. The method of claim 176, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

202. The method of claim 176, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

203. The method of claim 176, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

204. The method of claim 176, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

205. The method of claim 204, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

206. The method of claim 176, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

207. The method of claim 176, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

208. The method of claim 176, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

209. The method of claim 176, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

210. The method of claim 176, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

211. The method of claim 176, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

212. The method of claim 176, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

213. The method of claim 176, wherein producing the mixture from the formation comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

214. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute;

controlling the heat from the one or more heat sources such that an average temperature within at least a majority of the selected section of the formation is less than about 375 °C; and

producing a mixture from the formation.

215. The method of claim 214, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

216. The method of claim 214, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

217. The method of claim 214, wherein the one or more heat sources comprise electrical heaters.

218. The method of claim 214, wherein the one or more heat sources comprise surface burners.

219. The method of claim 214, wherein the one or more heat sources comprise flameless distributed combustors.

220. The method of claim 214, wherein the one or more heat sources comprise natural distributed combustors.

221. The method of claim 214, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

222. The method of claim 214, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

223. The method of claim 214, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

224. The method of claim 214, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

225. The method of claim 214, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

226. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

227. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

228. The method of claim 214, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

229. The method of claim 214, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

230. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

231. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

232. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

233. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

234. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

235. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

236. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

237. The method of claim 214, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

238. The method of claim 214, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

239. The method of claim 214, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

240. The method of claim 214, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

241. The method of claim 214, wherein controlling the heat further comprises controlling the heat such that coke production is inhibited.

242. The method of claim 214, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

243. The method of claim 242, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

244. The method of claim 214, further comprising altering the pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

245. The method of claim 214, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

246. The method of claim 214, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

247. The method of claim 214, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

248. The method of claim 214, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

249. The method of claim 214, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

250. The method of claim 214, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

251. The method of claim 214, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

252. The method of claim 214, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

253. The method of claim 214, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

254. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

producing a mixture from the formation, wherein at least a portion of the mixture is produced during the pyrolysis and the mixture moves through the formation in a vapor phase; and

maintaining a pressure within at least a majority of the selected section above about 2.0 bar absolute.

255. The method of claim 254, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

256. The method of claim 254, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

257. The method of claim 254, wherein the one or more heat sources comprise electrical heaters.

258. The method of claim 254, wherein the one or more heat sources comprise surface burners.

259. The method of claim 254, wherein the one or more heat sources comprise flameless distributed combustors.

260. The method of claim 254, wherein the one or more heat sources comprise natural distributed combustors.

261. The method of claim 254, further comprising controlling the pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

262. The method of claim 254, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

263. The method of claim 254, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

264. The method of claim 254, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

265. The method of claim 254, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

266. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

267. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

268. The method of claim 254, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

269. The method of claim 254, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

270. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

271. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

272. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

273. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

274. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

275. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

276. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

277. The method of claim 254, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

278. The method of claim 254, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

279. The method of claim 254, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

280. The method of claim 254, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

281. The method of claim 254, wherein the pressure is measured at a wellhead of a production well.

282. The method of claim 254, wherein the pressure is measured at a location within a wellbore of the production well.

283. The method of claim 254, wherein the pressure is maintained below about 100 bar absolute.

284. The method of claim 254, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

285. The method of claim 284, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

286. The method of claim 254, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

287. The method of claim 254, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

288. The method of claim 254, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

289. The method of claim 254, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

290. The method of claim 254, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

291. The method of claim 254, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

292. The method of claim 254, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

293. The method of claim 254, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

294. The method of claim 254, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

295. The method of claim 254, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

296. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

maintaining a pressure within at least a majority of the selected section of the formation above 2.0 bar absolute; and

producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity higher than an API gravity of condensable hydrocarbons in a mixture producible from the formation at the same temperature and at atmospheric pressure.

297. The method of claim 296, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

298. The method of claim 296, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

299. The method of claim 296, wherein the one or more heat sources comprise electrical heaters.

300. The method of claim 296, wherein the one or more heat sources comprise surface burners.

301. The method of claim 296, wherein the one or more heat sources comprise flameless distributed combustors.

302. The method of claim 296, wherein the one or more heat sources comprise natural distributed combustors.

303. The method of claim 296, further comprising controlling the pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

304. The method of claim 296, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

305. The method of claim 296, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

306. The method of claim 296, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

307. The method of claim 296, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

308. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

309. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

310. The method of claim 296, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

311. The method of claim 296, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

312. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

313. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

314. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

315. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

316. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

317. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

318. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

319. The method of claim 296, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

320. The method of claim 296, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen.

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

321. The method of claim 296, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

322. The method of claim 296, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

323. The method of claim 296, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

324. The method of claim 296, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

325. The method of claim 296, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

326. The method of claim 296, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

327. The method of claim 296, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

328. The method of claim 296, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

329. The method of claim 296, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

330. The method of claim 296, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

331. The method of claim 296, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

332. The method of claim 296, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

333. The method of claim 296, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

334. The method of claim 296, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

335. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

maintaining a pressure within at least a majority of the selected section of the formation to above 2.0 bar absolute; and

producing a fluid from the formation, wherein condensable hydrocarbons within the fluid comprise an atomic hydrogen to atomic carbon ratio of greater than about 1.75.

336. The method of claim 335, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

337. The method of claim 335, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

338. The method of claim 335, wherein the one or more heat sources comprise electrical heaters.

339. The method of claim 335, wherein the one or more heat sources comprise surface burners.

340. The method of claim 335, wherein the one or more heat sources comprise flameless distributed combustors.

341. The method of claim 335, wherein the one or more heat sources comprise natural distributed combustors.

342. The method of claim 335, further comprising controlling the pressure and a temperature within at least a majority of the selected section of the formation, wherein

the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

343. The method of claim 335, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

344. The method of claim 335, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

345. The method of claim 335, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

346. The method of claim 335, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

347. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

348. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

349. The method of claim 335, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

350. The method of claim 335, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

351. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

352. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

353. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

354. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

355. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

356. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

357. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

358. The method of claim 335, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

359. The method of claim 335, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

360. The method of claim 335, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

361. The method of claim 335, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

362. The method of claim 335, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

363. The method of claim 335, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

364. The method of claim 335, further comprising altering the pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

365. The method of claim 335, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

366. The method of claim 335, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

367. The method of claim 335, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

368. The method of claim 335, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

369. The method of claim 335, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

370. The method of claim 335, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

371. The method of claim 335, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

372. The method of claim 335, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

373. The method of claim 335, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

374. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

maintaining a pressure within at least a majority of the selected section of the formation to above 2.0 bar absolute; and

producing a mixture from the formation, wherein the produced mixture comprises a higher amount of non-condensable components as compared to non-condensable components producible from the formation under the same temperature conditions and at atmospheric pressure.

375. The method of claim 374, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

376. The method of claim 374, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

377. The method of claim 374, wherein the one or more heat sources comprise electrical heaters.

378. The method of claim 374, wherein the one or more heat sources comprise surface burners.

379. The method of claim 374, wherein the one or more heat sources comprise flameless distributed combustors.

380. The method of claim 374, wherein the one or more heat sources comprise natural distributed combustors.

381. The method of claim 374, further comprising controlling the pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

382. The method of claim 374, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

383. The method of claim 374, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

384. The method of claim 374, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

385. The method of claim 374, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

386. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

387. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

388. The method of claim 374, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

389. The method of claim 374, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

390. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

391. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

392. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

393. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

394. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

395. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

396. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

397. The method of claim 374, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

398. The method of claim 374, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

399. The method of claim 374, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

400. The method of claim 374, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

401. The method of claim 374, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

402. The method of claim 374, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

403. The method of claim 374, further comprising altering the pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

404. The method of claim 374, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

405. The method of claim 374, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

406. The method of claim 374, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

407. The method of claim 374, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

408. The method of claim 374, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

409. The method of claim 374, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

410. The method of claim 374, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

411. The method of claim 374, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

412. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation:

allowing the heat to transfer from the one or more heat sources to a selected section of the formation such that superimposed heat from the one or more heat sources pyrolyzes at least about 20 % by weight of hydrocarbons within the selected section of the formation; and

producing a mixture from the formation.

413. The method of claim 412, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

414. The method of claim 412, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

415. The method of claim 412, wherein the one or more heat sources comprise electrical heaters.

416. The method of claim 412, wherein the one or more heat sources comprise surface burners.

417. The method of claim 412, wherein the one or more heat sources comprise flameless distributed combustors.

418. The method of claim 412, wherein the one or more heat sources comprise natural distributed combustors.

419. The method of claim 412, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein

the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

420. The method of claim 412, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

421. The method of claim 412, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

422. The method of claim 412, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

423. The method of claim 412, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

424. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

425. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

426. The method of claim 412, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

427. The method of claim 412, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

428. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

429. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

430. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

431. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

432. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

433. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

434. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

435. The method of claim 412, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

436. The method of claim 412, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

437. The method of claim 412, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

438. The method of claim 412, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

439. The method of claim 412, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

440. The method of claim 412, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

441. The method of claim 412, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

442. The method of claim 412, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

443. The method of claim 412, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

444. The method of claim 412, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

445. The method of claim 412, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

446. The method of claim 412, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

447. The method of claim 412, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

448. The method of claim 412, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

449. The method of claim 412, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

450. The method of claim 412, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

451. The method of claim 412, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

452. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation such that superimposed heat from the one or more heat sources pyrolyzes at least about 20 % of hydrocarbons within the selected section of the formation; and

producing a mixture from the formation, wherein the mixture comprises a condensable component having an API gravity of at least about 25°.

453. The method of claim 452, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

454. The method of claim 452, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

455. The method of claim 452, wherein the one or more heat sources comprise electrical heaters.

456. The method of claim 452, wherein the one or more heat sources comprise surface burners.

457. The method of claim 452, wherein the one or more heat sources comprise flameless distributed combustors.

458. The method of claim 452, wherein the one or more heat sources comprise natural distributed combustors.

459. The method of claim 452, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

460. The method of claim 452, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

461. The method of claim 452, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

462. The method of claim 452, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

463. The method of claim 452, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

464. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

465. The method of claim 452, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

466. The method of claim 452, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

467. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

468. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

469. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

470. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

471. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

472. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

473. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

474. The method of claim 452, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

475. The method of claim 452, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen.

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

476. The method of claim 452, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

477. The method of claim 452, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

478. The method of claim 452, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

479. The method of claim 452, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

480. The method of claim 452, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

481. The method of claim 452, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

482. The method of claim 452, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

483. The method of claim 452, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

484. The method of claim 452, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

485. The method of claim 452, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

486. The method of claim 452, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

487. The method of claim 452, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

488. The method of claim 452, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

489. The method of claim 452, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

490. The method of claim 452, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

491. A method of treating a layer of a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the layer, wherein the one or more heat sources are positioned proximate an edge of the layer;

allowing the heat to transfer from the one or more heat sources to a selected section of the layer such that superimposed heat from the one or more heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation; and

producing a mixture from the formation.

492. The method of claim 491, wherein the one or more heat sources are laterally spaced from a center of the layer.

493. The method of claim 491, wherein the one or more heat sources are positioned in a staggered line.

494. The method of claim 491, wherein the one or more heat sources positioned proximate the edge of the layer can increase an amount of hydrocarbons produced per unit of energy input to the one or more heat sources.

495. The method of claim 491, wherein the one or more heat sources positioned proximate the edge of the layer can increase the volume of formation undergoing pyrolysis per unit of energy input to the one or more heat sources.

496. The method of claim 491, wherein the one or more heat sources comprise electrical heaters.

497. The method of claim 491, wherein the one or more heat sources comprise surface burners.

498. The method of claim 491, wherein the one or more heat sources comprise flameless distributed combustors.

499. The method of claim 491, wherein the one or more heat sources comprise natural distributed combustors.

500. The method of claim 491, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

501. The method of claim 491, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1.0 ° C per day during pyrolysis.

502. The method of claim 491, wherein providing heat from the one or more heat sources to at least the portion of the layer comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than *Pwr*, wherein *Pwr* is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein *Pwr* is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

503. The method of claim 491, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

504. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

505. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

506. The method of claim 491, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

507. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

508. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

509. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

510. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

511. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

512. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

513. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

514. The method of claim 491, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

515. The method of claim 491, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

516. The method of claim 491, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

517. The method of claim 491, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

518. The method of claim 491, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

519. The method of claim 491, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

520. The method of claim 519, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

521. The method of claim 491, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

522. The method of claim 491, further comprising controlling formation conditions, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

523. The method of claim 491, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

524. The method of claim 491, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

525. The method of claim 491, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

526. The method of claim 491, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

527. The method of claim 491, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

528. The method of claim 491, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

529. The method of claim 491, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

530. The method of claim 491, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

531. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure; and

producing a mixture from the formation.

532. The method of claim 531, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

533. The method of claim 531, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

534. The method of claim 531, wherein the one or more heat sources comprise electrical heaters.

535. The method of claim 531, wherein the one or more heat sources comprise surface burners.

536. The method of claim 531, wherein the one or more heat sources comprise flameless distributed combustors.

537. The method of claim 531, wherein the one or more heat sources comprise natural distributed combustors.

538. The method of claim 531, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

539. The method of claim 531, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

540. The method of claim 531, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

541. The method of claim 531, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

542. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

543. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

544. The method of claim 531, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

545. The method of claim 531, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

546. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

547. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

548. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

549. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

550. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

551. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

552. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

553. The method of claim 531, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

554. The method of claim 531, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen.

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

555. The method of claim 531, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

556. The method of claim 531, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

557. The method of claim 531, wherein the controlled pressure is at least about 2.0 bar absolute.

558. The method of claim 531, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

559. The method of claim 531, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

560. The method of claim 531, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

561. The method of claim 531, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

562. The method of claim 531, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

563. The method of claim 531, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

564. The method of claim 531, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

565. The method of claim 531, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

566. The method of claim 531, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

567. The method of claim 531, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

568. The method of claim 531, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

569. The method of claim 531, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

570. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation to raise an average temperature within the selected section to, or above, a temperature that will pyrolyze hydrocarbons within the selected section;

producing a mixture from the formation; and

controlling API gravity of the produced mixture to be greater than about 25 degrees API by controlling average pressure and average temperature in the selected section such that the average pressure in the selected section is greater than the pressure (p) set forth in the following equation for an assessed average temperature (T) in the selected section:

$$p = e^{[-44000/T + 67]}$$

where p is measured in psia and T is measured in ° Kelvin.

571. The method of claim 570, wherein the API gravity of the produced mixture is controlled to be greater than about 30 degrees API, and wherein the equation is:

$$p = e^{[-31000/T + 51]}.$$

572. The method of claim 570, wherein the API gravity of the produced mixture is controlled to be greater than about 35 degrees API, and wherein the equation is:

$$p = e^{[-22000/T + 38]}.$$

573. The method of claim 570, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

574. The method of claim 570, wherein controlling the average temperature comprises maintaining a temperature in the selected section within a pyrolysis temperature range.

575. The method of claim 570, wherein the one or more heat sources comprise electrical heaters.

576. The method of claim 570, wherein the one or more heat sources comprise surface burners.

577. The method of claim 570, wherein the one or more heat sources comprise flameless distributed combustors.

578. The method of claim 570, wherein the one or more heat sources comprise natural distributed combustors.

579. The method of claim 570, further comprising controlling a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

580. The method of claim 570, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

581. The method of claim 570, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

582. The method of claim 570, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

583. The method of claim 570, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

584. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

585. The method of claim 570, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

586. The method of claim 570, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

587. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

588. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

589. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

590. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

591. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

592. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

593. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

594. The method of claim 570, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

595. The method of claim 570, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

596. The method of claim 570, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

597. The method of claim 570, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

598. The method of claim 570, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

599. The method of claim 570, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

600. The method of claim 570, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

601. The method of claim 570, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

602. The method of claim 570, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

603. The method of claim 570, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

604. The method of claim 570, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

605. The method of claim 570, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

606. The method of claim 570, wherein the heat is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

607. The method of claim 570, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

608. The method of claim 570, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

609. The method of claim 570, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

610. A method of treating a coal formation in situ, comprising:

providing heat to at least a portion of a coal formation such that a temperature (T) in a substantial part of the heated portion exceeds 270 °C and hydrocarbons are pyrolyzed within the heated portion of the formation;

controlling a pressure (p) within at least a substantial part of the heated portion of the formation;

wherein $p_{bar} > e^{[(-A/T)+B-2.6744]}$;

wherein p is the pressure in bar absolute and T is the temperature in degrees K, and A and B are parameters that are larger than 10 and are selected in relation to the

characteristics and composition of the coal formation and on the required olefin content and carbon number of the pyrolyzed hydrocarbon fluids; and

producing pyrolyzed hydrocarbon fluids from the heated portion of the formation.

611. The method of claim 610, wherein A is greater than 14000 and B is greater than about 25 and a majority of the produced pyrolyzed hydrocarbon fluids have an average carbon number lower than 25 and comprise less than about 10 % by weight of olefins.

612. The method of claim 610, wherein T is less than about 390 °C, p is greater than about 1.4 bar, A is greater than about 44000, and b is greater than about 67, and a majority of the produced pyrolyzed hydrocarbon fluids have an average carbon number less than 25 and comprise less than 10 % by weight of olefins.

613. The method of claim 610, wherein T is less than about 390 °C, p is greater than about 2 bar, A is less than about 57000, and b is less than about 83, and a majority of the produced pyrolyzed hydrocarbon fluids have an average carbon number lower than about 21.

614. The method of claim 610, further comprising controlling the heat such that an average heating rate of the heated portion is less than about 3°C per day during pyrolysis.

615. The method of claim 610, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

616. The method of claim 610, wherein heat is transferred substantially by conduction from one or more heat sources located in one or more heat sources to the heated portion of the formation.

617. The method of claim 616, wherein the heat sources comprise heaters in which hydrocarbons are either injected into a heaters or released by the coal formation adjacent to a heater by an oxidant injected into the heater in or adjacent to which the combustion occurs and wherein at least part of the produced combustion gases are vented to surface via the heater in which the combustion occurs.

618. The method of claim 617, wherein heat is transferred substantially by conduction from one or more heat sources to the heated portion of the formation such that the thermal conductivity of at least part of the heated portion is substantially uniformly modified to a value greater than about 0.6 W/m °C and the permeability of said part increases substantially uniformly to a value greater than 1 Darcy.

619. The method of claim 610, further comprising controlling formation conditions to produce a mixture of hydrocarbon fluids and H_2, wherein a partial pressure of H_2 within the mixture flowing through the formation is greater than 0.5 Bar.

620. The method of claim 619, further comprising, hydrogenating a portion of the produced pyrolyzed hydrocarbon fluids with at least a portion of the produced hydrogen and heating the fluids with heat from hydrogenation .

621. The method of claim 610, wherein the coal formation is a coal seam and at least about 70% of the hydrocarbon content of the coal, when such hydrocarbon content is measured by a Fischer assay, is produced from the heated portion of the formation.

622. The method of claim 610, wherein the substantially gaseous pyrolyzed hydrocarbon fluids are produced from a production well, the method further comprising heating a wellbore of the production well to inhibit condensation of the hydrocarbon fluids within the wellbore.

623. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation to raise an average temperature within the selected section to, or above, a temperature that will pyrolyze hydrocarbons within the selected section;

producing a mixture from the formation; and

controlling a weight percentage of olefins of the produced mixture to be less than about 20 % by weight by controlling average pressure and average temperature in the selected section such that the average pressure in the selected section is greater than the pressure (p) set forth in the following equation for an assessed average temperature (T) in the selected section:

$$p = e^{[-57000\,T + 83]}$$

where p is measured in psia and T is measured in ° Kelvin.

624. The method of claim 623, wherein the weight percentage of olefins of the produced mixture is controlled to be less than about 10 % by weight, and wherein the equation is:

$$p = e^{[-16000\,T + 28]}.$$

625. The method of claim 623, wherein the weight percentage of olefins of the produced mixture is controlled to be less than about 5 % by weight, and wherein the equation is:

$$p = e^{[-12000\,T + 22]}.$$

626. The method of claim 623, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

627. The method of claim 623, wherein the one or more heat sources comprise electrical heaters.

628. The method of claim 623, wherein the one or more heat sources comprise surface burners.

629. The method of claim 623, wherein the one or more heat sources comprise flameless distributed combustors.

630. The method of claim 623, wherein the one or more heat sources comprise natural distributed combustors.

631. The method of claim 623, further comprising controlling a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

632. The method of claim 631, wherein controlling an average temperature comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

633. The method of claim 623, further comprising controlling the heat such that an average heating rate of the selected section is less than about 3.0 °C per day during pyrolysis.

634. The method of claim 623, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

635. The method of claim 623, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

636. The method of claim 623, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

637. The method of claim 623, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

638. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

639. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

640. The method of claim 623, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

641. The method of claim 623, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

642. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

643. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

644. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

645. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

646. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

647. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

648. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

649. The method of claim 623, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

650. The method of claim 623, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

651. The method of claim 623, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

652. The method of claim 623, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

653. The method of claim 623, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

654. The method of claim 623, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

655. The method of claim 623, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

656. The method of claim 623, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

657. The method of claim 623, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

658. The method of claim 623, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

659. The method of claim 623, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

660. The method of claim 623, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

661. The method of claim 623, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

662. The method of claim 623, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

663. The method of claim 623, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

664. The method of claim 623, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

665. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation to raise an average temperature within the selected section to, or above, a temperature that will pyrolyze hydrocarbons within the selected section;

producing a mixture from the formation; and

controlling hydrocarbons having carbon numbers greater than 25 of the produced mixture to be less than about 25 % by weight by controlling average pressure and average temperature in the selected section such that the average pressure in the selected section is greater than the pressure (p) set forth in the following equation for an assessed average temperature (T) in the selected section:

$$p = e^{[-14000/T + 25]}$$

where p is measured in psia and T is measured in ° Kelvin.

666. The method of claim 665, wherein the hydrocarbons having carbon numbers greater than 25 of the produced mixture is controlled to be less than about 20 % by weight, and wherein the equation is:

$$p = e^{[-16000/T + 28]}.$$

667. The method of claim 665, wherein the hydrocarbons having carbon numbers greater than 25 of the produced mixture is controlled to be less than about 15 % by weight, and wherein the equation is:

$$p = e^{[-18000/T + 32]}.$$

668. The method of claim 665, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

669. The method of claim 665, wherein the one or more heat sources comprise electrical heaters.

670. The method of claim 665, wherein the one or more heat sources comprise surface burners.

671. The method of claim 665, wherein the one or more heat sources comprise flameless distributed combustors.

672. The method of claim 665, wherein the one or more heat sources comprise natural distributed combustors.

673. The method of claim 665, further comprising controlling a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

674. The method of claim 673, wherein controlling the temperature comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

675. The method of claim 665, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

676. The method of claim 665, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

677. The method of claim 665, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

678. The method of claim 665, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

679. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

680. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

681. The method of claim 665, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

682. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

683. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

684. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

685. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

686. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

687. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

688. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

689. The method of claim 665, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

690. The method of claim 665, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

691. The method of claim 665, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

692. The method of claim 665, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

693. The method of claim 665, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

694. The method of claim 665, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

695. The method of claim 665, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

696. The method of claim 665, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

697. The method of claim 665, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

698. The method of claim 665, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

699. The method of claim 665, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

700. The method of claim 665, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

701. The method of claim 665, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

702. The method of claim 665, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

703. The method of claim 665, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat

sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

704. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation to raise an average temperature within the selected section to, or above, a temperature that will pyrolyze hydrocarbons within the selected section;

producing a mixture from the formation; and

controlling an atomic hydrogen to carbon ratio of the produced mixture to be greater than about 1.7 by controlling average pressure and average temperature in the selected section such that the average pressure in the selected section is greater than the pressure (p) set forth in the following equation for an assessed average temperature (T) in the selected section:

$$p = e^{[-38000/T + 61]}$$

where p is measured in psia and T is measured in ° Kelvin.

705. The method of claim 704, wherein the atomic hydrogen to carbon ratio of the produced mixture is controlled to be greater than about 1.8, and wherein the equation is:

$$p = e^{[-13000/T + 24]}.$$

706. The method of claim 704, wherein the atomic hydrogen to carbon ratio of the produced mixture is controlled to be greater than about 1.9, and wherein the equation is:

$$p = e^{[-8000/T + 18]}.$$

707. The method of claim 704, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

708. The method of claim 704, wherein the one or more heat sources comprise electrical heaters.

709. The method of claim 704, wherein the one or more heat sources comprise surface burners.

710. The method of claim 704, wherein the one or more heat sources comprise flameless distributed combustors.

711. The method of claim 704, wherein the one or more heat sources comprise natural distributed combustors.

712. The method of claim 704, further comprising controlling a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

713. The method of claim 712, wherein controlling the temperature comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

714. The method of claim 704, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

715. The method of claim 704, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$Pwr = h*V*C_v*\rho_B$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

716. The method of claim 704, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

717. The method of claim 704, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

718. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

719. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

720. The method of claim 704, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

721. The method of claim 704, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

722. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

723. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

724. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

725. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

726. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

727. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

728. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

729. The method of claim 704, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

730. The method of claim 704, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

731. The method of claim 704, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

732. The method of claim 704, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

733. The method of claim 704, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

734. The method of claim 704, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

735. The method of claim 704, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

736. The method of claim 704, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

737. The method of claim 704, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

738. The method of claim 704, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

739. The method of claim 704, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

740. The method of claim 704, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

741. The method of claim 704, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

742. The method of claim 704, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

743. The method of claim 704, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

744. The method of claim 704, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat

sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

745. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least one portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

controlling a pressure-temperature relationship within at least the selected section of the formation by selected energy input into the one or more heat sources and by pressure release from the selected section through wellbores of the one or more heat sources; and

producing a mixture from the formation.

746. The method of claim 745, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

747. The method of claim 745, wherein the one or more heat sources comprise at least two heat sources.

748. The method of claim 745, wherein the one or more heat sources comprise surface burners.

749. The method of claim 745, wherein the one or more heat sources comprise flameless distributed combustors.

750. The method of claim 745, wherein the one or more heat sources comprise natural distributed combustors.

751. The method of claim 745, further comprising controlling the pressure-temperature relationship by controlling a rate of removal of fluid from the formation.

752. The method of claim 745, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

753. The method of claim 745, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

754. The method of claim 745, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

755. The method of claim 745, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

756. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

757. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

758. The method of claim 745, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

759. The method of claim 745, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

760. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

761. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

762. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

763. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

764. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

765. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

766. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

767. The method of claim 745, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

768. The method of claim 745, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

769. The method of claim 745, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

770. The method of claim 745, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

771. The method of claim 745, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

772. The method of claim 745, further comprising controlling formation conditions to produce a mixture of hydrocarbon fluids and H_2, wherein the partial pressure of H_2 within the mixture is greater than about 0.5 bar.

773. The method of claim 745, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

774. The method of claim 745, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

775. The method of claim 745, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

776. The method of claim 745, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

777. The method of claim 745, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

778. The method of claim 745, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

779. The method of claim 745, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

780. The method of claim 745, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

781. The method of claim 745, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

782. The method of claim 745, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

783. The method of claim 745, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

784. The method of claim 745, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

785. A method of treating a coal formation in situ, comprising:
heating a selected volume (V) of the coal formation, wherein formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

786. The method of claim 785, wherein heating a selected volume comprises heating with an electrical heater.

787. The method of claim 785, wherein heating a selected volume comprises heating with a surface burner.

788. The method of claim 785, wherein heating a selected volume comprises heating with a flameless distributed combustor.

789. The method of claim 785, wherein heating a selected volume comprises heating with a natural distributed combustors.

790. The method of claim 785, further comprising controlling a pressure and a temperature within at least a majority of the selected volume of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

791. The method of claim 785, further comprising controlling the heating such that an average heating rate of the selected volume is less than about 1 °C per day during pyrolysis.

792. The method of claim 785, wherein a value for C_v is determined as an average heat capacity of two or more samples taken from the coal formation.

793. The method of claim 785, wherein heating the selected volume comprises transferring heat substantially by conduction.

794. The method of claim 785, wherein heating the selected volume comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

795. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

796. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

797. The method of claim 785, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

798. The method of claim 785, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

799. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

800. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

801. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

802. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable

hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

803. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

804. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

805. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

806. The method of claim 785, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

807. The method of claim 785, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

808. The method of claim 785, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

809. The method of claim 785, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer

810. The method of claim 785, further comprising controlling a pressure within at least a majority of the selected volume of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

811. The method of claim 785, further comprising controlling formation conditions to produce a mixture from the formation comprising condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

812. The method of claim 785, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

813. The method of claim 785, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

814. The method of claim 785, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

815. The method of claim 785, further comprising:

providing hydrogen (H_2) to the heated volume to hydrogenate hydrocarbons within the volume; and

heating a portion of the volume with heat from hydrogenation.

816. The method of claim 785, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

817. The method of claim 785, further comprising increasing a permeability of a majority of the selected volume to greater than about 100 millidarcy.

818. The method of claim 785, further comprising substantially uniformly increasing a permeability of a majority of the selected volume.

819. The method of claim 785, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

820. The method of claim 785, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

821. The method of claim 785, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

822. The method of claim 785, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

823. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation to raise an average temperature within the selected section to, or above, a temperature that will pyrolyze hydrocarbons within the selected section;

controlling heat output from the one or more heat sources such that an average heating rate of the selected section rises by less than about 3 °C per day when the average temperature of the selected section is at, or above, the temperature that will pyrolyze hydrocarbons within the selected section; and

producing a mixture from the formation.

824. The method of claim 823, controlling heat output comprises:

raising the average temperature within the selected section to a first temperature that is at or above a minimum pyrolysis temperature of hydrocarbons within the formation;

limiting energy input into the one or more heat sources to inhibit increase in temperature of the selected section; and

increasing energy input into the formation to raise an average temperature of the selected section above the first temperature when production of formation fluid declines below a desired production rate.

825. The method of claim 823, controlling heat output comprises:

raising the average temperature within the selected section to a first temperature that is at or above a minimum pyrolysis temperature of hydrocarbons within the formation;

limiting energy input into the one or more heat sources to inhibit increase in temperature of the selected section; and

increasing energy input into the formation to raise an average temperature of the selected section above the first temperature when quality of formation fluid produced from the formation falls below a desired quality.

826. The method of claim 823, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section.

827. The method of claim 823, wherein the one or more heat sources comprise electrical heaters.

828. The method of claim 823, wherein the one or more heat sources comprise surface burners.

829. The method of claim 823, wherein the one or more heat sources comprise flameless distributed combustors.

830. The method of claim 823, wherein the one or more heat sources comprise natural distributed combustors.

831. The method of claim 823, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

832. The method of claim 823, wherein the heat is controlled that an average heating rate of the selected section is less than about 1.5 °C per day during pyrolysis.

833. The method of claim 823, wherein the heat is controlled that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

834. The method of claim 823, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density.

835. The method of claim 823, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

836. The method of claim 823, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

837. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

838. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

839. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, wherein the condensable hydrocarbons have an olefin content is less than about 2.5 % by weight of the condensable hydrocarbons, and wherein the olefin content is greater than about 0.1 % by weight of the condensable hydrocarbons.

840. The method of claim 823, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

841. The method of claim 823, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.10 and wherein the ratio of ethene to ethane is greater than about 0.001.

842. The method of claim 823, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.05 and wherein the ratio of ethene to ethane is greater than about 0.001.

843. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

844. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

845. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

846. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

847. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

848. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

849. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

850. The method of claim 823, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

851. The method of claim 823, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

852. The method of claim 823, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

853. The method of claim 823, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

854. The method of claim 823, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

855. The method of claim 823, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

856. The method of claim 823, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

857. The method of claim 823, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

858. The method of claim 823, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

859. The method of claim 823, further comprising:

providing H_2 to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

860. The method of claim 823, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

861. The method of claim 823, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

862. The method of claim 823, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

863. The method of claim 823, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

864. The method of claim 823, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

865. The method of claim 823, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

866. The method of claim 823, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

867. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation; to heat a selected section of the formation to an average temperature above about 270 °C;

allowing the heat to transfer from the one or more heat sources to the selected section of the formation;

controlling the heat from the one or more heat sources such that an average heating rate of the selected section is less than about 3 °C per day during pyrolysis; and

producing a mixture from the formation.

868. The method of claim 867, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

869. The method of claim 867, wherein the one or more heat sources comprise electrical heaters.

870. The method of claim 867, further comprising supplying electricity to the electrical heaters substantially during non-peak hours.

871. The method of claim 867, wherein the one or more heat sources comprise surface burners.

872. The method of claim 867, wherein the one or more heat sources comprise flameless distributed combustors.

873. The method of claim 867, wherein the one or more heat sources comprise natural distributed combustors.

874. The method of claim 867, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

875. The method of claim 867, wherein the heat is further controlled such that an average heating rate of the selected section is less than about 3 °C/day until production of condensable hydrocarbons substantially ceases.

876. The method of claim 867, wherein the heat is further controlled that an average heating rate of the selected section is less than about 1.5 °C per day during pyrolysis.

877. The method of claim 867, wherein the heat is further controlled such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

878. The method of claim 867, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density.

879. The method of claim 867, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

880. The method of claim 867, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

881. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

882. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

883. The method of claim 867, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

884. The method of claim 867, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

885. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

886. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

887. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

888. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

889. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

890. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

891. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

892. The method of claim 867, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

893. The method of claim 867, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

894. The method of claim 867, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

895. The method of claim 867, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

896. The method of claim 867, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

897. The method of claim 867, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

898. The method of claim 897, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

899. The method of claim 867, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

900. The method of claim 867, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

901. The method of claim 867, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

902. The method of claim 867, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

903. The method of claim 867, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

904. The method of claim 867, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

905. The method of claim 867, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

906. The method of claim 867, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

907. The method of claim 867, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

908. The method of claim 867, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

909. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

producing a mixture from the formation through at least one production well;

monitoring a temperature at or in the production well; and

controlling heat input to raise the monitored temperature at a rate of less than about 3 °C per day.

910. The method of claim 909, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

911. The method of claim 909, wherein the one or more heat sources comprise electrical heaters.

912. The method of claim 909, wherein the one or more heat sources comprise surface burners.

913. The method of claim 909, wherein the one or more heat sources comprise flameless distributed combustors.

914. The method of claim 909, wherein the one or more heat sources comprise natural distributed combustors.

915. The method of claim 909, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

916. The method of claim 909, wherein the heat is controlled that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

917. The method of claim 909, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density.

918. The method of claim 909, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

919. The method of claim 909, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

920. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

921. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

922. The method of claim 909, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-

condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

923. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

924. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

925. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

926. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

927. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

928. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

929. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

930. The method of claim 909, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

931. The method of claim 909, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

932. The method of claim 909, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

933. The method of claim 909, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

934. The method of claim 909, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

935. The method of claim 909, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

936. The method of claim 935, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

937. The method of claim 909, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

938. The method of claim 909, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

939. The method of claim 909, further comprising:

providing H_2 to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

940. The method of claim 909, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

941. The method of claim 909, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

942. The method of claim 909, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

943. The method of claim 909, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

944. The method of claim 909, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

945. The method of claim 909, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

946. The method of claim 909, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

947. A method of treating a coal formation in situ, comprising:

heating a portion of the formation to a temperature sufficient to support oxidation of hydrocarbons within the portion, wherein the portion is located substantially adjacent to a wellbore;

flowing an oxidant through a conduit positioned within the wellbore to a heat source zone within the portion, wherein the heat source zone supports an oxidation reaction between hydrocarbons and the oxidant;

reacting a portion of the oxidant with hydrocarbons to generate heat; and

transferring generated heat substantially by conduction to a pyrolysis zone of the formation to pyrolyze at least a portion of the hydrocarbons within the pyrolysis zone.

948. The method of claim 947, wherein heating the portion of the formation comprises raising a temperature of the portion above about 400 °C.

949. The method of claim 947, wherein the conduit comprises critical flow orifices, the method further comprising flowing the oxidant through the critical flow orifices to the heat source zone.

950. The method of claim 947, further comprising removing reaction products from the heat source zone through the wellbore.

951. The method of claim 947, further comprising removing excess oxidant from the heat source zone to inhibit transport of the oxidant to the pyrolysis zone.

952. The method of claim 947, further comprising transporting the oxidant from the conduit to the heat source zone substantially by diffusion.

953. The method of claim 947, further comprising heating the conduit with reaction products being removed through the wellbore.

954. The method of claim 947, wherein the oxidant comprises hydrogen peroxide.

955. The method of claim 947, wherein the oxidant comprises air.

956. The method of claim 947, wherein the oxidant comprises a fluid substantially free of nitrogen.

957. The method of claim 947, further comprising limiting an amount of oxidant to maintain a temperature of the heat source zone less than about 1200 °C.

958. The method of claim 947, wherein heating the portion of the formation comprises electrically heating the formation.

959. The method of claim 947, wherein heating the portion of the formation comprises heating the portion using exhaust gases from a surface burner.

960. The method of claim 947, wherein heating the portion of the formation comprises heating the portion with a flameless distributed combustor.

961. The method of claim 947, further comprising controlling a pressure and a temperature within at least a majority of the pyrolysis zone, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

962. The method of claim947, further comprising controlling the heat such that an average heating rate of the pyrolysis zone is less than about 1 °C per day during pyrolysis.

963. The method of claim 947, wherein heating the portion comprises heating the pyrolysis zone such that a thermal conductivity of at least a portion of the pyrolysis zone is greater than about 0.5 W/(m °C).

964. The method of claim 947, further comprising controlling a pressure within at least a majority of the pyrolysis zone of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

965. The method of claim 947, further comprising:

providing hydrogen (H_2) to the pyrolysis zone to hydrogenate hydrocarbons within the pyrolysis zone; and

heating a portion of the pyrolysis zone with heat from hydrogenation.

966. The method of claim 947, wherein transferring generated heat comprises increasing a permeability of a majority of the pyrolysis zone to greater than about 100 millidarcy.

967. The method of claim 947, wherein transferring generated heat comprises substantially uniformly increasing a permeability of a majority of the pyrolysis zone.

968. The method of claim 947, wherein the heating is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

969. The method of claim 947, wherein the wellbore is located along strike to reduce pressure differentials along a heated length of the wellbore.

970. The method of claim 947, wherein the wellbore is located along strike to increase uniformity of heating along a heated length of the wellbore.

971. The method of claim 947, wherein the wellbore is located along strike to increase control of heating along a heated length of the wellbore.

972. A method of treating a coal formation in situ, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidant;

flowing the oxidant into a conduit, and wherein the conduit is connected such that the oxidant can flow from the conduit to the hydrocarbons;

allowing the oxidant and the hydrocarbons to react to produce heat in a heat source zone;

allowing heat to transfer from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons within the pyrolysis zone; and

removing reaction products such that the reaction products are inhibited from flowing from the heat source zone to the pyrolysis zone.

973. The method of claim 972, wherein heating the portion of the formation comprises raising the temperature of the portion above about 400 °C.

974. The method of claim 972, wherein heating the portion of the formation comprises electrically heating the formation.

975. The method of claim 972, wherein heating the portion of the formation comprises heating the portion using exhaust gases from a surface burner.

976. The method of claim 972, wherein the conduit comprises critical flow orifices, the method further comprising flowing the oxidant through the critical flow orifices to the heat source zone.

977. The method of claim 972, wherein the conduit is located within a wellbore, wherein removing reaction products comprises removing reaction products from the heat source zone through the wellbore.

978. The method of claim 972, further comprising removing excess oxidant from the heat source zone to inhibit transport of the oxidant to the pyrolysis zone.

979. The method of claim 972, further comprising transporting the oxidant from the conduit to the heat source zone substantially by diffusion.

980. The method of claim 972, wherein the conduit is located within a wellbore, the method further comprising heating the conduit with reaction products being removed through the wellbore to raise a temperature of the oxidant passing through the conduit.

981. The method of claim 972, wherein the oxidant comprises hydrogen peroxide.

982. The method of claim 972, wherein the oxidant comprises air.

983. The method of claim 972, wherein the oxidant comprises a fluid substantially free of nitrogen.

984. The method of claim 972, further comprising limiting an amount of oxidant to maintain a temperature of the heat source zone less than about 1200 °C.

985. The method of claim 972, further comprising limiting an amount of oxidant to maintain a temperature of the heat source zone at a temperature that inhibits production of oxides of nitrogen.

986. The method of claim 972, wherein heating a portion of the formation to a temperature sufficient to support oxidation of hydrocarbons within the portion further comprises heating with a flameless distributed combustor.

987. The method of claim 972, further comprising controlling a pressure and a temperature within at least a majority of the pyrolysis zone of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

988. The method of claim 972, further comprising controlling the heat such that an average heating rate of the pyrolysis zone is less than about 1 °C per day during pyrolysis.

989. The method of claim 972, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

990. The method of claim 972, wherein allowing heat to transfer comprises heating the pyrolysis zone such that a thermal conductivity of at least a portion of the pyrolysis zone is greater than about 0.5 W/(m °C).

991. The method of claim 972, further comprising controlling a pressure within at least a majority of the pyrolysis zone, wherein the controlled pressure is at least about 2.0 bar absolute.

992. The method of claim 972, further comprising:

providing hydrogen (H_2) to the pyrolysis zone to hydrogenate hydrocarbons within the pyrolysis zone; and

heating a portion of the pyrolysis zone with heat from hydrogenation.

993. The method of claim 972, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the pyrolysis zone to greater than about 100 millidarcy.

994. The method of claim 972, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the pyrolysis zone.

995. The method of claim 972, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

996. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein the portion is located substantially adjacent to an opening in the formation;

providing the oxidizing fluid to a heat source zone in the formation;

allowing the oxidizing gas to react with at least a portion of the hydrocarbons at the heat source zone to generate heat in the heat source zone; and

transferring the generated heat substantially by conduction from the heat source zone to a pyrolysis zone in the formation.

997. The method of claim 996, further comprising transporting the oxidizing fluid through the heat source zone by diffusion.

998. The method of claim 996, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

999. The method of claim 996, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

1000. The method of claim 996, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit.

1001. The method of claim 996, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through

the conduit and transferring substantial heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

1002. The method of claim 996, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

1003. The method of claim 996, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

1004. The method of claim 996, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

1005. The method of claim 996, wherein the heat source zone extends radially from the opening a width of less than approximately 0.15 m.

1006. The method of claim 996, wherein heating the portion comprises applying electrical current to an electric heater disposed within the opening.

1007. The method of claim 996, wherein the pyrolysis zone is substantially adjacent to the heat source zone.

1008. The method of claim 996, further comprising controlling a pressure and a temperature within at least a majority of the pyrolysis zone of the formation, wherein the

pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1009. The method of claim 996, further comprising controlling the heat such that an average heating rate of the pyrolysis zone is less than about 1 °C per day during pyrolysis.

1010. The method of claim 996, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1011. The method of claim 996, wherein allowing heat to transfer comprises heating the portion such that a thermal conductivity of at least a portion of the pyrolysis zone is greater than about 0.5 W/(m °C).

1012. The method of claim 996, further comprising controlling a pressure within at least a majority of the pyrolysis zone, wherein the controlled pressure is at least about 2.0 bar absolute.

1013. The method of claim 996, further comprising:

providing hydrogen (H_2) to the pyrolysis zone to hydrogenate hydrocarbons within the pyrolysis zone; and

heating a portion of the pyrolysis zone with heat from hydrogenation.

1014. The method of claim 996, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the pyrolysis zone to greater than about 100 millidarcy.

1015. The method of claim 996, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the pyrolysis zone.

1016. The method of claim 996, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1017. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

producing a mixture from the formation; and

maintaining an average temperature within the selected section above a minimum pyrolysis temperature and below a vaporization temperature of hydrocarbons having carbon numbers greater than 25 to inhibit production of a substantial amount of hydrocarbons having carbon numbers greater than 25 in the mixture.

1018. The method of claim 1017, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1019. The method of claim 1017, wherein maintaining the average temperature within the selected section comprises maintaining the temperature within a pyrolysis temperature range.

1020. The method of claim 1017, wherein the one or more heat sources comprise electrical heaters.

1021. The method of claim 1017, wherein the one or more heat sources comprise surface burners.

1022. The method of claim 1017, wherein the one or more heat sources comprise flameless distributed combustors.

1023. The method of claim 1017, wherein the one or more heat sources comprise natural distributed combustors.

1024. The method of claim 1017, wherein the minimum pyrolysis temperature is greater than about 270 °C.

1025. The method of claim 1017, wherein the vaporization temperature is less than approximately 450 °C at atmospheric pressure.

1026. The method of claim 1017, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1027. The method of claim 1017, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1028. The method of claim 1017, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1029. The method of claim 1017, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1030. The method of claim 1017, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1031. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1032. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1033. The method of claim 1017, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

1034. The method of claim 1017, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1035. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1036. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1037. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1038. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1039. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1040. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1041. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1042. The method of claim 1017, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1043. The method of claim 1017, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1044. The method of claim 1017, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1045. The method of claim 1017, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1046. The method of claim 1017, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1047. The method of claim 1017, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1048. The method of claim 1047, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1049. The method of claim 1017, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1050. The method of claim 1017, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1051. The method of claim 1017, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1052. The method of claim 1017, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1053. The method of claim 1017, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1054. The method of claim 1017, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1055. The method of claim 1017, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1056. The method of claim 1017, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1057. The method of claim 1017, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1058. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

controlling a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than 25; and

producing a mixture from the formation.

1059. The method of claim 1058, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1060. The method of claim 1058, wherein the one or more heat sources comprise electrical heaters.

1061. The method of claim 1058, wherein the one or more heat sources comprise surface burners.

1062. The method of claim 1058, wherein the one or more heat sources comprise flameless distributed combustors.

1063. The method of claim 1058, wherein the one or more heat sources comprise natural distributed combustors.

1064. The method of claim 1058, further comprising controlling a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1065. The method of claim 1064, wherein controlling the temperature comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

1066. The method of claim 1058, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1067. The method of claim 1058, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1068. The method of claim 1058, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1069. The method of claim 1058, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1070. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1071. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1072. The method of claim 1058, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

1073. The method of claim 1058, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1074. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1075. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1076. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1077. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1078. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1079. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1080. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1081. The method of claim 1058, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1082. The method of claim 1058, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1083. The method of claim 1058, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1084. The method of claim 1058, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1085. The method of claim 1058, further comprising controlling the pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1086. The method of claim 1058, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1087. The method of claim 1086, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1088. The method of claim 1058, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1089. The method of claim 1058, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1090. The method of claim 1058, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1091. The method of claim 1058, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1092. The method of claim 1058, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1093. The method of claim 1058, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1094. The method of claim 1058, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1095. The method of claim 1058, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1096. The method of claim 1058, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1097. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1098. The method of claim 1097, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1099. The method of claim 1097, wherein the one or more heat sources comprise electrical heaters.

1100. The method of claim 1097, wherein the one or more heat sources comprise surface burners.

1101. The method of claim 1097, wherein the one or more heat sources comprise flameless distributed combustors.

1102. The method of claim 1097, wherein the one or more heat sources comprise natural distributed combustors.

1103. The method of claim 1097, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1104. The method of claim 1097, wherein controlling the temperature comprises maintaining the temperature within the selected section within a pyrolysis temperature range.

1105. The method of claim 1097, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1106. The method of claim 1097, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1107. The method of claim 1097, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1108. The method of claim 1097, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1109. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1110. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1111. The method of claim 1097, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

1112. The method of claim 1097, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1113. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1114. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1115. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1116. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1117. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1118. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1119. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1120. The method of claim 1097, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1121. The method of claim 1097, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1122. The method of claim 1097, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1123. The method of claim 1097, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1124. The method of claim 1097, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1125. The method of claim 1097, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1126. The method of claim 1125, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1127. The method of claim 1097, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1128. The method of claim 1097, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1129. The method of claim 1097, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1130. The method of claim 1097, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1131. The method of claim 1097, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1132. The method of claim 1097, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1133. The method of claim 1097, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1134. The method of claim 1097, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1135. The method of claim 1097, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1136. The method of claim 1097, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1137. A method of treating a coal formation in situ, comprising:

heating a section of the formation to a pyrolysis temperature from at least a first heat source, a second heat source and a third heat source, and wherein the first heat source, the second heat source and the third heat source are located along a perimeter of the section;

controlling heat input to the first heat source, the second heat source and the third heat source to limit a heating rate of the section to a rate configured to produce a mixture from the formation with an olefin content of less than about 15% by weight of condensable fluids (on a dry basis) within the produced mixture; and

producing the mixture from the formation through a production well.

1138. The method of claim 1137, wherein superposition of heat form the first heat source, second heat source, and third heat source pyrolyzes a portion of the hydrocarbons within the formation to fluids

1139. The method of claim 1137, wherein the pyrolysis temperature is between about 270 °C and about 400 °C.

1140. The method of claim 1137, wherein the first heat source is operated for less than about twenty four hours a day.

1141. The method of claim 1137, wherein the first heat source comprises an electrical heater.

1142. The method of claim 1137, wherein the first heat source comprises a surface burner.

1143. The method of claim 1137, wherein the first heat source comprises a flameless distributed combustor.

1144. The method of claim 1137, wherein the first heat source, second heat source and third heat source are positioned substantially at apexes of an equilateral triangle.

1145. The method of claim 1137, wherein the production well is located substantially at a geometrical center of the first heat source, second heat source, and third heat source.

1146. The method of claim 1137, further comprising a fourth heat source, fifth heat source, and sixth heat source located along the perimeter of the section.

1147. The method of claim 1146, wherein the heat sources are located substantially at apexes of a regular hexagon.

1148. The method of claim 1147, wherein the production well is located substantially at a center of the hexagon.

1149. The method of claim 1137, further comprising controlling a pressure and a temperature within at least a majority of the section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1150. The method of claim 1137, wherein controlling the temperature comprises maintaining the temperature within the selected section within a pyrolysis temperature range.

1151. The method of claim 1137, further comprising controlling the heat such that an average heating rate of the section is less than about 3 °C per day during pyrolysis.

1152. The method of claim 1137, further comprising controlling the heat such that an average heating rate of the section is less than about 1 °C per day during pyrolysis.

1153. The method of claim 1137, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1154. The method of claim 1137, wherein heating the section of the formation comprises transferring heat substantially by conduction.

1155. The method of claim 1137, wherein providing heat from the one or more heat sources comprises heating the section such that a thermal conductivity of at least a portion of the section is greater than about 0.5 W/(m °C).

1156. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1157. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1158. The method of claim 1137, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1159. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1160. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1161. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1162. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1163. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1164. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1165. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1166. The method of claim 1137, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1167. The method of claim 1137, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1168. The method of claim 1137, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1169. The method of claim 1137, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1170. The method of claim 1137, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1171. The method of claim 1137, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1172. The method of claim 1171, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1173. The method of claim 1137, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1174. The method of claim 1137, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1175. The method of claim 1137, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1176. The method of claim 1137, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1177. The method of claim 1137, heating the section comprises increasing a permeability of a majority of the section to greater than about 100 millidarcy.

1178. The method of claim 1137, wherein heating the section comprises substantially uniformly increasing a permeability of a majority of the section.

1179. The method of claim 1137, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1180. The method of claim 1137, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1181. The method of claim 1137, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1182. The method of claim 1137, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1183. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1184. The method of claim 1183, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1185. The method of claim 1183, wherein the one or more heat sources comprise electrical heaters.

1186. The method of claim 1183, wherein the one or more heat sources comprise surface burners.

1187. The method of claim 1183, wherein the one or more heat sources comprise flameless distributed combustors.

1188. The method of claim 1183, wherein the one or more heat sources comprise natural distributed combustors.

1189. The method of claim 1183, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1190. The method of claim 1189, wherein controlling the temperature comprises maintaining the temperature within the selected section within a pyrolysis temperature range.

1191. The method of claim 1183, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1192. The method of claim 1183, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1193. The method of claim 1183, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1194. The method of claim 1183, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1195. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1196. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1197. The method of claim 1183, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

1198. The method of claim 1183, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1199. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1200. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1201. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable

hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1202. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1203. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1204. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1205. The method of claim 1183, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1206. The method of claim 1183, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1207. The method of claim 1183, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1208. The method of claim 1183, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1209. The method of claim 1183, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1210. The method of claim 1183, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1211. The method of claim 1211, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1212. The method of claim 1183, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1213. The method of claim 1183, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1214. The method of claim 1183, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1215. The method of claim 1183, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1216. The method of claim 1183, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1217. The method of claim 1183, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1218. The method of claim 1183, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1219. The method of claim 1183, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1220. The method of claim 1183, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1221. The method of claim 1183, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1222. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1223. The method of claim 1222, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1224. The method of claim 1222, wherein the one or more heat sources comprise electrical heaters.

1225. The method of claim 1222, wherein the one or more heat sources comprise surface burners.

1226. The method of claim 1222, wherein the one or more heat sources comprise flameless distributed combustors.

1227. The method of claim 1222, wherein the one or more heat sources comprise natural distributed combustors.

1228. The method of claim 1222, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1229. The method of claim 1228, wherein controlling the temperature comprises maintaining the temperature within the selected section within a pyrolysis temperature range.

1230. The method of claim 1222, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1231. The method of claim 1222, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1232. The method of claim 1222, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1233. The method of claim 1222, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1234. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1235. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1236. The method of claim 1222, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

1237. The method of claim 1222, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1238. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1239. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1240. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1241. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1242. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1243. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1244. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1245. The method of claim 1222, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1246. The method of claim 1222, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1247. The method of claim 1222, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1248. The method of claim 1222, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1249. The method of claim 1222, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1250. The method of claim 1222, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1251. The method of claim 1250, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1252. The method of claim 1222, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1253. The method of claim 1222, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1254. The method of claim 1222, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1255. The method of claim 1222, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1256. The method of claim 1222, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1257. The method of claim 1222, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1258. The method of claim 1222, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1259. The method of claim 1222, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1260. The method of claim 1222, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1261. The method of claim 1222, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1262. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1263. The method of claim 1262, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1264. The method of claim 1262, wherein the one or more heat sources comprise electrical heaters.

1265. The method of claim 1262, wherein the one or more heat sources comprise surface burners.

1266. The method of claim 1262, wherein the one or more heat sources comprise flameless distributed combustors.

1267. The method of claim 1262, wherein the one or more heat sources comprise natural distributed combustors.

1268. The method of claim 1262, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1269. The method of claim 1268, wherein controlling the temperature comprises maintaining the temperature within the selected section within a pyrolysis temperature range.

1270. The method of claim 1262, further comprising controlling the heat into such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1271. The method of claim 1262, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1272. The method of claim 1262, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1273. The method of claim 1262, wherein providing heat from the one or more heat sources comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1274. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1275. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1276. The method of claim 1262, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the non-condensable hydrocarbons are olefins.

1277. The method of claim 1262, wherein the produced mixture comprises non-condensable hydrocarbons, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons is less than about 0.15, and wherein the ratio of ethene to ethane is greater than about 0.001.

1278. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1279. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1280. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1281. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1282. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1283. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1284. The method of claim 1262, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1285. The method of claim 1262, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1286. The method of claim 1262, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1287. The method of claim 1262, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1288. The method of claim 1262, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1289. The method of claim 1262, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1290. The method of claim 1289, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

1291. The method of claim 1262, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1292. The method of claim 1262, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1293. The method of claim 1262, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1294. The method of claim 1262, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1295. The method of claim 1262, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1296. The method of claim 1262, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1297. The method of claim 1262, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1298. The method of claim 1262, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1299. The method of claim 1262, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1300. The method of claim 1262, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1301. A method of treating a coal formation in situ, comprising:

raising a temperature of a first section of the formation with one or more heat sources to a first pyrolysis temperature;

heating the first section to an upper pyrolysis temperature, wherein heat is supplied to the first section at a rate configured to inhibit olefin production;

producing a first mixture from the formation, wherein the first mixture comprises condensable hydrocarbons and H_2;

creating a second mixture from the first mixture, wherein the second mixture comprises a higher concentration of H_2 than the first mixture;

raising a temperature of a second section of the formation with one or more heat sources to a second pyrolysis temperature;

providing a portion of the second mixture to the second section;

heating the second section to an upper pyrolysis temperature, wherein heat is supplied to the second section at a rate configured to inhibit olefin production; and

producing a third mixture from the second section.

1302. The method of claim 1301, wherein creating the second mixture comprises removing condensable hydrocarbons from the first mixture.

1303. The method of claim 1301, wherein creating the second mixture comprises removing water from the first mixture.

1304. The method of claim 1301, wherein creating the second mixture comprises removing carbon dioxide from the first mixture.

1305. The method of claim 1301, wherein the first pyrolysis temperature is greater than about 270 °C.

1306. The method of claim 1301, wherein the second pyrolysis temperature is greater than about 270 °C.

1307. The method of claim 1301, wherein the upper pyrolysis temperature is about 500 °C.

1308. The method of claim 1301, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat

sources pyrolyzes at least some hydrocarbons within the first or second selected section of the formation.

1309. The method of claim 1301, wherein the one or more heat sources comprise electrical heaters.

1310. The method of claim 1301, wherein the one or more heat sources comprise surface burners.

1311. The method of claim 1301, wherein the one or more heat sources comprise flameless distributed combustors.

1312. The method of claim 1301, wherein the one or more heat sources comprise natural distributed combustors.

1313. The method of claim 1301, further comprising controlling a pressure and a temperature within at least a majority of the first section and the second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1314. The method of claim 1301, further comprising controlling the heat to the first and second sections such that an average heating rate of the first and second sections is less than about 1 °C per day during pyrolysis.

1315. The method of claim 1301, wherein heating the first and the second sections comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1316. The method of claim 1301, wherein heating the first and second sections comprises transferring heat substantially by conduction.

1317. The method of claim 1301, wherein heating the first and second sections comprises heating the first and second sections such that a thermal conductivity of at least a portion of the first and second sections is greater than about 0.5 W/(m °C).

1318. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1319. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1320. The method of claim 1301, wherein the first or third mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1321. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1322. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1323. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1324. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1325. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1326. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1327. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1328. The method of claim 1301, wherein the first or third mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1329. The method of claim 1301, wherein the first or third mixture comprises a non-condensable component, and wherein the non-condensable component comprises hydrogen, and wherein the hydrogen is greater than about 10 % by volume of the non-condensable component and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1330. The method of claim 1301, wherein the first or third mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1331. The method of claim 1301, wherein the first or third mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1332. The method of claim 1301, further comprising controlling a pressure within at least a majority of the first or second sections of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1333. The method of claim 1301, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1334. The method of claim 1333, wherein the partial pressure of H_2 within a mixture is measured when the mixture is at a production well.

1335. The method of claim 1301, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1336. The method of claim 1301, further comprising:

providing hydrogen (H_2) to the first or second section to hydrogenate hydrocarbons within the first or second section; and

heating a portion of the first or second section with heat from hydrogenation.

1337. The method of claim 1301, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1338. The method of claim 1301, further comprising increasing a permeability of a majority of the first or second section to greater than about 100 millidarcy.

1339. The method of claim 1301, further comprising substantially uniformly increasing a permeability of a majority of the first or second section.

1340. The method of claim 1301, wherein the heating is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1341. The method of claim 1301, wherein producing the first or third mixture comprises producing the first or third mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1342. The method of claim 1301, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1343. The method of claim 1301, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1344. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

producing a mixture from the formation; and

hydrogenating a portion of the produced mixture with H_2 produced from the formation.

1345. The method of claim 1344, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1346. The method of claim 1344, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1347. The method of claim 1344, wherein the one or more heat sources comprise electrical heaters.

1348. The method of claim 1344, wherein the one or more heat sources comprise surface burners.

1349. The method of claim 1344, wherein the one or more heat sources comprise flameless distributed combustors.

1350. The method of claim 1344, wherein the one or more heat sources comprise natural distributed combustors.

1351. The method of claim 1344, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1352. The method of claim 1344, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1353. The method of claim 1344, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1354. The method of claim 1344, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1355. The method of claim 1344, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1356. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1357. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1358. The method of claim 1344, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1359. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1360. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1361. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1362. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1363. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1364. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1365. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1366. The method of claim 1344, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1367. The method of claim 1344, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1368. The method of claim 1344, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1369. The method of claim 1344, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1370. The method of claim 1344, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1371. The method of claim 1344, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1372. The method of claim 1344, wherein the partial pressure of H2 within the mixture is measured when the mixture is at a production well.

1373. The method of claim 1344, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1374. The method of claim 1344, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1375. The method of claim 1344, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1376. The method of claim 1344, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1377. The method of claim 1344, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1378. The method of claim 1344, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1379. The method of claim 1344, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1380. The method of claim 1344, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1381. A method of treating a coal formation in situ, comprising:

heating a first section of the formation:

producing H_2 from the first section of formation:

heating a second section of the formation: and

recirculating a portion of the H_2 from the first section into the second section of the formation to provide a reducing environment within the second section of the formation.

1382. The method of claim 1381, wherein heating the first section or heating the second section comprises heating with an electrical heater.

1383. The method of claim 1381, wherein heating the first section or heating the second section comprises heating with a surface burner.

1384. The method of claim 1381, wherein heating the first section or heating the second section comprises heating with a flameless distributed combustor.

1385. The method of claim 1381, wherein heating the first section or heating the second section comprises heating with a natural distributed combustor.

1386. The method of claim 1381, further comprising controlling a pressure and a temperature within at least a majority of the first or second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1387. The method of claim 1381, further comprising controlling the heat such that an average heating rate of the first or second section is less than about 1 °C per day during pyrolysis.

1388. The method of claim 1381, wherein heating the first section or heating the second section further comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1389. The method of claim 1381, wherein heating the first section or heating the second section comprises transferring heat substantially by conduction.

1390. The method of claim 1381, wherein heating the first section or heating the second section comprises heating the formation such that a thermal conductivity of at least a portion of the first or second section is greater than about 0.5 W/(m °C).

1391. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1392. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1393. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1394. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1395. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1396. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1397. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1398. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1399. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1400. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1401. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1402. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1403. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1404. The method of claim 1381, further comprising producing a mixture from the second section, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1405. The method of claim 1381, further comprising controlling a pressure within at least a majority of the first or second section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1406. The method of claim 1381, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1407. The method of claim 1406, wherein the partial pressure of H_2 within a mixture is measured when the mixture is at a production well.

1408. The method of claim 1381, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1409. The method of claim 1381, further comprising:

providing hydrogen (H_2) to the second section to hydrogenate hydrocarbons within the section; and

heating a portion of the second section with heat from hydrogenation.

1410. The method of claim 1381, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1411. The method of claim 1381, wherein heating the first section or heating the second section comprises increasing a permeability of a majority of the first or second section, respectively, to greater than about 100 millidarcy.

1412. The method of claim 1381, wherein heating the first section or heating the second section comprises substantially uniformly increasing a permeability of a majority of the first or second section, respectively.

1413. The method of claim 1381, further comprises controlling the heating of the first section or controlling the heat of the second section to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1414. The method of claim 1381, further comprising producing a mixture from the formation in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1415. The method of claim 1381, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1416. The method of claim 1381, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1417. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

producing a mixture from the formation; and

controlling formation conditions such that the mixture produced from the formation comprises condensable hydrocarbons including H_2, wherein the partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1418. The method of claim 1417, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1419. The method of claim 1417, wherein controlling formation conditions comprises maintaining a temperature within the selected section within a pyrolysis temperature range.

1420. The method of claim 1417, wherein the one or more heat sources comprise electrical heaters.

1421. The method of claim 1417, wherein the one or more heat sources comprise surface burners.

1422. The method of claim 1417, wherein the one or more heat sources comprise flameless distributed combustors.

1423. The method of claim 1417, wherein the one or more heat sources comprise natural distributed combustors.

1424. The method of claim 1417, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1425. The method of claim 1417, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1426. The method of claim 1417, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1427. The method of claim 1417, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1428. The method of claim 1417, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1429. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1430. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1431. The method of claim 1417, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1432. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1433. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1434. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1435. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1436. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1437. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1438. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1439. The method of claim 1417, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1440. The method of claim 1417, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen,

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1441. The method of claim 1417, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1442. The method of claim 1417, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1443. The method of claim 1417, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1444. The method of claim 1417, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1445. The method of claim 1417, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

1446. The method of claim 1417, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1447. The method of claim 1417, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1448. The method of claim 1417, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1449. The method of claim 1417, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1450. The method of claim 1417, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1451. The method of claim 1417, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1452. The method of claim 1417, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1453. The method of claim 1417, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1454. The method of claim 1417, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1455. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

maintaining a pressure of the selected section above atmospheric pressure to increase a partial pressure of H_2, as compared to the partial pressure of H_2 at atmospheric pressure, in at least a majority of the selected section; and

producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1456. The method of claim 1455, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1457. The method of claim 1455, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1458. The method of claim 1455, wherein the one or more heat sources comprise electrical heaters.

1459. The method of claim 1455, wherein the one or more heat sources comprise surface burners.

1460. The method of claim 1455, wherein the one or more heat sources comprise flameless distributed combustors.

1461. The method of claim 1455, wherein the one or more heat sources comprise natural distributed combustors.

1462. The method of claim 1455, further comprising controlling the pressure and a temperature within at least a majority of the selected section of the formation, wherein

the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1463. The method of claim 1455, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1464. The method of claim 1455, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1465. The method of claim 1455, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1466. The method of claim 1455, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1467. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1468. The method of claim 1455, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1469. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1470. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1471. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1472. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1473. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1474. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1475. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1476. The method of claim 1455, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1477. The method of claim 1455, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1478. The method of claim 1455, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1479. The method of claim 1455, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1480. The method of claim 1455, further comprising controlling the pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1481. The method of claim 1455, further comprising increasing the pressure of the selected section, to an upper limit of about 21 bar absolute, to increase an amount of non-condensable hydrocarbons produced from the formation.

1482. The method of claim 1455, further comprising decreasing pressure of the selected section, to a lower limit of about atmospheric pressure, to increase an amount of condensable hydrocarbons produced from the formation.

1483. The method of claim 1455, wherein the partial pressure comprises a partial pressure based on properties measured at a production well.

1484. The method of claim 1455, further comprising altering the pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1485. The method of claim 1455, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1486. The method of claim 1455, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1487. The method of claim 1455, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1488. The method of claim 1455, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1489. The method of claim 1455, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1490. The method of claim 1455, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1491. The method of claim 1455, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1492. The method of claim 1455, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1493. The method of claim 1455, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1494. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

providing H_2 to the formation to produce a reducing environment in at least some of the formation;

producing a mixture from the formation.

1495. The method of claim 1494, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1496. The method of claim 1494, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1497. The method of claim 1494, further comprising separating a portion of hydrogen within the mixture and recirculating the portion into the formation.

1498. The method of claim 1494, wherein the one or more heat sources comprise electrical heaters.

1499. The method of claim 1494, wherein the one or more heat sources comprise surface burners.

1500. The method of claim 1494, wherein the one or more heat sources comprise flameless distributed combustors.

1501. The method of claim 1494, wherein the one or more heat sources comprise natural distributed combustors.

1502. The method of claim 1494, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1503. The method of claim 1494, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1504. The method of claim 1494, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1505. The method of claim 1494, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1506. The method of claim 1494, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1507. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1508. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1509. The method of claim 1494, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1510. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1511. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1512. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1513. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1514. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1515. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1516. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1517. The method of claim 1494, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1518. The method of claim 1494, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen,

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1519. The method of claim 1494, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1520. The method of claim 1494, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1521. The method of claim 1494, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1522. The method of claim 1494, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1523. The method of claim 1494, wherein the partial pressure of H2 within the mixture is measured when the mixture is at a production well.

1524. The method of claim 1494, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1525. The method of claim 1494, wherein providing hydrogen (H_2) to the formation further comprises:

hydrogenating hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1526. The method of claim 1494, further comprising:

producing hydrogen and condensable hydrocarbons from the formation: and hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1527. The method of claim 1494, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1528. The method of claim 1494, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1529. The method of claim 1494, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1530. The method of claim 1494, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1531. The method of claim 1494, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1532. The method of claim 1494, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1533. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

providing H_2 to the selected section to hydrogenate hydrocarbons within the selected section and to heat a portion of the section with heat from the hydrogenation; and

controlling heating of the selected section by controlling amounts of H_2 provided to the selected section.

1534. The method of claim 1533, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1535. The method of claim 1533, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1536. The method of claim 1533, wherein the one or more heat sources comprise electrical heaters.

1537. The method of claim 1533, wherein the one or more heat sources comprise surface burners.

1538. The method of claim 1533, wherein the one or more heat sources comprise flameless distributed combustors.

1539. The method of claim 1533, wherein the one or more heat sources comprise natural distributed combustors.

1540. The method of claim 1533, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1541. The method of claim 1533, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1542. The method of claim 1533, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1543. The method of claim 1533, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1544. The method of claim 1533, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1545. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1546. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1547. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1548. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1549. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1550. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1551. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1552. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1553. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1554. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1555. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1556. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1557. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1558. The method of claim 1533, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1559. The method of claim 1533, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1560. The method of claim 1533, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1561. The method of claim 1560, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1562. The method of claim 1533, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1563. The method of claim 1533, further comprising controlling formation conditions by recirculating a portion of hydrogen from a produced mixture into the formation.

1564. The method of claim 1533, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1565. The method of claim 1533, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1566. The method of claim 1533, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1567. The method of claim 1533, wherein the heating is controlled of claim 1533, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1568. The method of claim 1533, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1569. The method of claim 1533, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1570. An in situ method for producing H_2 from a coal formation, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation, wherein a H_2 partial pressure within the mixture is greater than about 0.5 bar.

1571. The method of claim 1570, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1572. The method of claim 1570, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1573. The method of claim 1570, wherein the one or more heat sources comprise electrical heaters.

1574. The method of claim 1570, wherein the one or more heat sources comprise surface burners.

1575. The method of claim 1570, wherein the one or more heat sources comprise flameless distributed combustors.

1576. The method of claim 1570, wherein the one or more heat sources comprise natural distributed combustors.

1577. The method of claim 1570, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1578. The method of claim 1570, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1579. The method of claim 1570, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1580. The method of claim 1570, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1581. The method of claim 1570, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1582. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1583. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1584. The method of claim 1570, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1585. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1586. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1587. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1588. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1589. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1590. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1591. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1592. The method of claim 1570, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1593. The method of claim 1570, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1594. The method of claim 1570, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1595. The method of claim 1570, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1596. The method of claim 1570, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1597. The method of claim 1570, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1598. The method of claim 1570, further comprising recirculating a portion of the hydrogen within the mixture into the formation.

1599. The method of claim 1570, further comprising condensing a hydrocarbon component from the produced mixture and hydrogenating the condensed hydrocarbons with a portion of the hydrogen.

1600. The method of claim 1570, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1601. The method of claim 1570, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1602. The method of claim 1570, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1603. The method of claim 1570, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1604. The method of claim 1570, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1605. The method of claim 1570, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1606. The method of claim 1570, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1607. The method of claim 1570, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1608. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using an atomic hydrogen weight percentage of at least a portion of hydrocarbons in the selected section.

and wherein at least the portion of the hydrocarbons in the selected section comprises an atomic hydrogen weight percentage, when measured on a dry, ash-free basis, of greater than about 4.0 %; and

producing a mixture from the formation.

1609. The method of claim 1608, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1610. The method of claim 1608, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1611. The method of claim 1608, wherein the one or more heat sources comprise electrical heaters.

1612. The method of claim 1608, wherein the one or more heat sources comprise surface burners.

1613. The method of claim 1608, wherein the one or more heat sources comprise flameless distributed combustors.

1614. The method of claim 1608, wherein the one or more heat sources comprise natural distributed combustors.

1615. The method of claim 1608, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1616. The method of claim 1608, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1617. The method of claim 1608, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1618. The method of claim 1608, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1619. The method of claim 1608, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1620. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1621. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1622. The method of claim 1608, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1623. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1624. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1625. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1626. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1627. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1628. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1629. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1630. The method of claim 1608, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1631. The method of claim 1608, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1632. The method of claim 1608, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1633. The method of claim 1608, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1634. The method of claim 1608, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1635. The method of claim 1608, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1636. The method of claim 1635, wherein the partial pressure of H2 within the mixture is measured when the mixture is at a production well.

1637. The method of claim 1608, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1638. The method of claim 1608, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1639. The method of claim 1608, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1640. The method of claim 1608, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1641. The method of claim 1608, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1642. The method of claim 1608, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1643. The method of claim 1608, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1644. The method of claim 1608, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1645. The method of claim 1608, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1646. The method of claim 1608, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1647. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein at least some hydrocarbons within the selected section have an initial atomic hydrogen weight percentage of greater than about 4.0 %; and

producing a mixture from the formation.

1648. The method of claim 1647, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1649. The method of claim 1647, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1650. The method of claim 1647, wherein the one or more heat sources comprise electrical heaters.

1651. The method of claim 1647, wherein the one or more heat sources comprise surface burners.

1652. The method of claim 1647, wherein the one or more heat sources comprise flameless distributed combustors.

1653. The method of claim 1647, wherein the one or more heat sources comprise natural distributed combustors.

1654. The method of claim 1647, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1655. The method of claim 1647, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1656. The method of claim 1647, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1657. The method of claim 1647, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1658. The method of claim 1647, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1659. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1660. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1661. The method of claim 1647, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1662. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1663. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1664. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1665. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable

hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1666. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1667. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1668. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1669. The method of claim 1647, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1670. The method of claim 1647, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1671. The method of claim 1647, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1672. The method of claim 1647, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1673. The method of claim 1647, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1674. The method of claim 1647, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1675. The method of claim 1674, wherein the partial pressure of H2 within the mixture is measured when the mixture is at a production well.

1676. The method of claim 1647, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1677. The method of claim 1647, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1678. The method of claim 1647, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1679. The method of claim 1647, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1680. The method of claim 1647, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1681. The method of claim 1647, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1682. The method of claim 1647, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1683. The method of claim 1647, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1684. The method of claim 1647, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1685. The method of claim 1647, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1686. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using vitrinite reflectance of at least some hydrocarbons in the selected section, and wherein at least a portion of the hydrocarbons in the selected section comprises a vitrinite reflectance of greater than about 0.3 %;

wherein at least a portion of the hydrocarbons in the selected section comprises a vitrinite reflectance of less than about 4.5 %; and

producing a mixture from the formation.

1687. The method of claim 1686, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1688. The method of claim 1686, further comprising maintaining a temperature within the selected section within a pyrolysis temperature.

1689. The method of claim 1686, wherein the vitrinite reflectance of at least the portion of hydrocarbons within the selected section is between about 0.47 % and about 1.5 % such that a majority of the produced mixture comprises condensable hydrocarbons.

1690. The method of claim 1686, wherein the vitrinite reflectance of at least the portion of hydrocarbons within the selected section is between about 1.4 % and about 4.2 % such that a majority of the produced mixture comprises non-condensable hydrocarbons.

1691. The method of claim 1686, wherein the one or more heat sources comprise electrical heaters.

1692. The method of claim 1686, wherein the one or more heat sources comprise surface burners.

1693. The method of claim 1686, wherein the one or more heat sources comprise flameless distributed combustors.

1694. The method of claim 1686, wherein the one or more heat sources comprise natural distributed combustors.

1695. The method of claim 1686, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1696. The method of claim 1686, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1697. The method of claim 1686, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1698. The method of claim 1686, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1699. The method of claim 1686, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1700. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1701. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1702. The method of claim 1686, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1703. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1704. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1705. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1706. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1707. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1708. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1709. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1710. The method of claim 1686, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1711. The method of claim 1686, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1712. The method of claim 1686, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1713. The method of claim 1686, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1714. The method of claim 1686, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1715. The method of claim 1686, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1716. The method of claim 1715, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1717. The method of claim 1686, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1718. The method of claim 1686, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1719. The method of claim 1686, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1720. The method of claim 1686, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1721. The method of claim 1686, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1722. The method of claim 1686, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1723. The method of claim 1686, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1724. The method of claim 1686, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1725. The method of claim 1686, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1726. The method of claim 1686, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1727. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using a total organic matter weight percentage of at least a portion of the selected section, and wherein at least the portion of the selected section comprises a total organic matter weight percentage, of at least about 5.0 %; and

producing a mixture from the formation.

1728. The method of claim 1727, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1729. The method of claim 1727, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1730. The method of claim 1727, wherein the one or more heat sources comprise electrical heaters.

1731. The method of claim 1727, wherein the one or more heat sources comprise surface burners.

1732. The method of claim 1727, wherein the one or more heat sources comprise flameless distributed combustors.

1733. The method of claim 1727, wherein the one or more heat sources comprise natural distributed combustors.

1734. The method of claim 1727, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1735. The method of claim 1727, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1736. The method of claim 1727, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$Pwr = h*V*C_v*\rho_B$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1737. The method of claim 1727, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1738. The method of claim 1727, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1739. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1740. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1741. The method of claim 1727, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1742. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1743. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1744. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1745. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1746. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1747. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1748. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1749. The method of claim 1727, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1750. The method of claim 1727, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1751. The method of claim 1727, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1752. The method of claim 1727, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1753. The method of claim 1727, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1754. The method of claim 1727, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1755. The method of claim 1754, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1756. The method of claim 1727, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1757. The method of claim 1727, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1758. The method of claim 1727, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1759. The method of claim 1727, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1760. The method of claim 1727, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1761. The method of claim 1727, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1762. The method of claim 1727, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1763. The method of claim 1727, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1764. The method of claim 1727, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1765. The method of claim 1727, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1766. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein at least some hydrocarbons within the selected section have an initial total organic matter weight percentage of at least about 5.0%; and

producing a mixture from the formation.

1767. The method of claim 1766, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1768. The method of claim 1766, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1769. The method of claim 1766, wherein the one or more heat sources comprise electrical heaters.

1770. The method of claim 1766, wherein the one or more heat sources comprise surface burners.

1771. The method of claim 1766, wherein the one or more heat sources comprise flameless distributed combustors.

1772. The method of claim 1766, wherein the one or more heat sources comprise natural distributed combustors.

1773. The method of claim 1766, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1774. The method of claim 1766, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1775. The method of claim 1766, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1776. The method of claim 1766, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1777. The method of claim 1766, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1778. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1779. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1780. The method of claim 1766, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1781. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1782. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1783. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1784. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1785. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1786. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1787. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1788. The method of claim 1766, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1789. The method of claim 1766, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1790. The method of claim 1766, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1791. The method of claim 1766, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1792. The method of claim 1766, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1793. The method of claim 1766, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1794. The method of claim 1793, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1795. The method of claim 1766, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1796. The method of claim 1766, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1797. The method of claim 1766, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1798. The method of claim 1766, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1799. The method of claim 1766, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1800. The method of claim 1766, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1801. The method of claim 1766, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1802. The method of claim 1766, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1803. The method of claim 1766, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1804. The method of claim 1766, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1805. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using an atomic oxygen weight percentage of at least a portion of hydrocarbons in the selected section, and wherein at least a portion of the hydrocarbons in the selected section comprises an atomic oxygen weight percentage of less than about 15% when measured on a dry, ash free basis; and

producing a mixture from the formation.

1806. The method of claim 1805, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1807. The method of claim 1805, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1808. The method of claim 1805, wherein the one or more heat sources comprise electrical heaters.

1809. The method of claim 1805, wherein the one or more heat sources comprise surface burners.

1810. The method of claim 1805, wherein the one or more heat sources comprise flameless distributed combustors.

1811. The method of claim 1805, wherein the one or more heat sources comprise natural distributed combustors.

1812. The method of claim 1805, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1813. The method of claim 1805, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1814. The method of claim 1805, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1815. The method of claim 1805, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1816. The method of claim 1805, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1817. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1818. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1819. The method of claim 1805, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1820. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1821. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1822. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1823. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1824. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1825. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1826. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1827. The method of claim 1805, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1828. The method of claim 1805, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1829. The method of claim 1805, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1830. The method of claim 1805, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1831. The method of claim 1805, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1832. The method of claim 1805, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1833. The method of claim 1832, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1834. The method of claim 1805, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1835. The method of claim 1805, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1836. The method of claim 1805, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1837. The method of claim 1805, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1838. The method of claim 1805, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1839. The method of claim 1805, wherein allowing the heat to transfer further comprises substantially uniformly increasing a permeability of a majority of the selected section.

1840. The method of claim 1805, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1841. The method of claim 1805, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1842. The method of claim 1805, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1843. The method of claim 1805, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1844. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to a selected section of the formation;

allowing the heat to transfer from the one or more heat sources to the selected section of the formation to pyrolyze hydrocarbon within the selected section;

wherein at least some hydrocarbons within the selected section have an initial atomic oxygen weight percentage of less than about 15%; and

producing a mixture from the formation.

1845. The method of claim 1844, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1846. The method of claim 1844, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range

1847. The method of claim 1844, wherein the one or more heat sources comprise electrical heaters.

1848. The method of claim 1844, wherein the one or more heat sources comprise surface burners.

1849. The method of claim 1844, wherein the one or more heat sources comprise flameless distributed combustors.

1850. The method of claim 1844, wherein the one or more heat sources comprise natural distributed combustors.

1851. The method of claim 1844, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein

the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1852. The method of claim 1844, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1853. The method of claim 1844, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1854. The method of claim 1844, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1855. The method of claim 1844, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1856. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1857. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1858. The method of claim 1844, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1859. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1860. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1861. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1862. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1863. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1864. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1865. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1866. The method of claim 1844, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1867. The method of claim 1844, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1868. The method of claim 1844, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1869. The method of claim 1844, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1870. The method of claim 1844, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1871. The method of claim 1844, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1872. The method of claim 1871, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1873. The method of claim 1844, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1874. The method of claim 1844, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1875. The method of claim 1844, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1876. The method of claim 1844, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1877. The method of claim 1844, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1878. The method of claim 1844, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1879. The method of claim 1844, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1880. The method of claim 1844, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1881. The method of claim 1844, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1882. The method of claim 1844, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1883. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using an atomic hydrogen to carbon ratio of at least a portion of hydrocarbons in the selected section, wherein at least a portion of the hydrocarbons in the selected section comprises an atomic hydrogen to carbon ratio greater than about 0.70, and wherein the atomic hydrogen to carbon ratio is less than about 1.65; and

producing a mixture from the formation.

1884. The method of claim 1883, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1885. The method of claim 1883, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1886. The method of claim 1883, wherein the one or more heat sources comprise electrical heaters.

1887. The method of claim 1883, wherein the one or more heat sources comprise surface burners.

1888. The method of claim 1883, wherein the one or more heat sources comprise flameless distributed combustors.

1889. The method of claim 1883, wherein the one or more heat sources comprise natural distributed combustors.

1890. The method of claim 1883, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1891. The method of claim 1883, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1892. The method of claim 1883, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1893. The method of claim 1883, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1894. The method of claim 1883, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1895. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1896. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1897. The method of claim 1883, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1898. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1899. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1900. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1901. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1902. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1903. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1904. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1905. The method of claim 1883, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1906. The method of claim 1883, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen,

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1907. The method of claim 1883, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1908. The method of claim 1883, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1909. The method of claim 1883, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1910. The method of claim 1883, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1911. The method of claim 1910, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1912. The method of claim 1883, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1913. The method of claim 1883, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1914. The method of claim 1883, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1915. The method of claim 1883, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1916. The method of claim 1883, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1917. The method of claim 1883, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1918. The method of claim 1883, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1919. The method of claim 1883, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1920. The method of claim 1883, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1921. The method of claim 1883, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1922. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to a selected section of the formation;

allowing the heat to transfer from the one or more heat sources to the selected section of the formation to pyrolyze hydrocarbons within the selected section;

wherein at least some hydrocarbons within the selected section have an initial atomic hydrogen to carbon ratio greater than about 0.70;

wherein the initial atomic hydrogen to carbon ration is less than about 1.65; and

producing a mixture from the formation.

1923. The method of claim 1922, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1924. The method of claim 1922, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1925. The method of claim 1922, wherein the one or more heat sources comprise electrical heaters.

1926. The method of claim 1922, wherein the one or more heat sources comprise surface burners.

1927. The method of claim 1922, wherein the one or more heat sources comprise flameless distributed combustors.

1928. The method of claim 1922, wherein the one or more heat sources comprise natural distributed combustors.

1929. The method of claim 1922, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1930. The method of claim 1922, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1931. The method of claim 1922, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1932. The method of claim 1922, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1933. The method of claim 1922, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1934. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1935. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1936. The method of claim 1922, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1937. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1938. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1939. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1940. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1941. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1942. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1943. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1944. The method of claim 1922, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1945. The method of claim 1922, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1946. The method of claim 1922, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1947. The method of claim 1922, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1948. The method of claim 1922, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1949. The method of claim 1922, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1950. The method of claim 1949, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1951. The method of claim 1922, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1952. The method of claim 1922, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1953. The method of claim 1922, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1954. The method of claim 1922, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1955. The method of claim 1922, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1956. The method of claim 1922, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

1957. The method of claim 1922, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1958. The method of claim 1922, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1959. The method of claim 1922, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1960. The method of claim 1922, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

1961. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using an atomic oxygen to carbon ratio of at least a portion of hydrocarbons in the selected section, wherein at least a portion of the hydrocarbons in the selected section comprises an atomic oxygen to carbon ratio greater than about 0.025, and wherein the atomic oxygen to carbon ratio of at least a portion of the hydrocarbons in the selected section is less than about 0.15 and

producing a mixture from the formation.

1962. The method of claim 1961, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

1963. The method of claim 1961, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

1964. The method of claim 1961, wherein the one or more heat sources comprise electrical heaters.

1965. The method of claim 1961, wherein the one or more heat sources comprise surface burners.

1966. The method of claim 1961, wherein the one or more heat sources comprise flameless distributed combustors.

1967. The method of claim 1961, wherein the one or more heat sources comprise natural distributed combustors.

1968. The method of claim 1961, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1969. The method of claim 1961, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

1970. The method of claim 1961, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

1971. The method of claim 1961, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

1972. The method of claim 1961, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

1973. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

1974. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

1975. The method of claim 1961, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

1976. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

1977. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

1978. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

1979. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

1980. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

1981. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

1982. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

1983. The method of claim 1961, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

1984. The method of claim 1961, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen,

wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

1985. The method of claim 1961, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

1986. The method of claim 1961, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

1987. The method of claim 1961, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

1988. The method of claim 1961, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

1989. The method of claim 1988, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

1990. The method of claim 1961, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

1991. The method of claim 1961, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

1992. The method of claim 1961, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

1993. The method of claim 1961, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

1994. The method of claim 1961, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

1995. The method of claim 1961, wherein allowing the heat to transfer further comprises substantially uniformly increasing a permeability of a majority of the selected section.

1996. The method of claim 1961, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

1997. The method of claim 1961, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

1998. The method of claim 1961, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

1999. The method of claim 1961, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat

sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2000. A method of treating a coal formation in situ, comprising

providing heat from one or more heat sources to a selected section of the formation;

allowing the heat to transfer from the one or more heat sources to the selected section of the formation to pyrolyze hydrocarbons within the selected section;

wherein at least some hydrocarbons within the selected section have an initial atomic oxygen to carbon ratio greater than about 0.025;

wherein the initial atomic oxygen to carbon ratio is less than about 0.15; and

producing a mixture from the formation.

2001. The method of claim 2000, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2002. The method of claim 2000, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2003. The method of claim 2000, wherein the one or more heat sources comprise electrical heaters.

2004. The method of claim 2000, wherein the one or more heat sources comprise surface burners.

2005. The method of claim 2000, wherein the one or more heat sources comprise flameless distributed combustors.

2006. The method of claim 2000, wherein the one or more heat sources comprise natural distributed combustors.

2007. The method of claim 2000, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2008. The method of claim 2000, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2009. The method of claim 2000, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2010. The method of claim 2000, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2011. The method of claim 2000, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2012. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2013. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2014. The method of claim 2000, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2015. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2016. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2017. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2018. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2019. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2020. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2021. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2022. The method of claim 2000, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2023. The method of claim 2000, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2024. The method of claim 2000, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2025. The method of claim 2000, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2026. The method of claim 2000, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2027. The method of claim 2000, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2028. The method of claim 2027, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2029. The method of claim 2000, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2030. The method of claim 2000, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2031. The method of claim 2000, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2032. The method of claim 2000, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2033. The method of claim 2000, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2034. The method of claim 2000, wherein allowing the heat to transfer further comprises substantially uniformly increasing a permeability of a majority of the selected section.

2035. The method of claim 2000, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2036. The method of claim 2000, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2037. The method of claim 2000, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2038. The method of claim 2000, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2039. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section has been selected for heating using a moisture content in the selected section, and wherein at least a portion of the selected section comprises a moisture content of less than about 15%; and

producing a mixture from the formation.

2040. The method of claim 2039, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat

sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2041. The method of claim 2039, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2042. The method of claim 2039, wherein the one or more heat sources comprise electrical heaters.

2043. The method of claim 2039, wherein the one or more heat sources comprise surface burners.

2044. The method of claim 2039, wherein the one or more heat sources comprise flameless distributed combustors.

2045. The method of claim 2039, wherein the one or more heat sources comprise natural distributed combustors.

2046. The method of claim 2039, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2047. The method of claim 2039, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2048. The method of claim 2039, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2049. The method of claim 2039, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2050. The method of claim 2039, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2051. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2052. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2053. The method of claim 2039, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2054. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2055. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2056. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2057. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2058. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2059. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2060. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2061. The method of claim 2039, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2062. The method of claim 2039, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2063. The method of claim 2039, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2064. The method of claim 2039, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2065. The method of claim 2039, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2066. The method of claim 2039, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2067. The method of claim 2066, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2068. The method of claim 2039, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2069. The method of claim 2039, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2070. The method of claim 2039, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2071. The method of claim 2039, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2072. The method of claim 2039, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2073. The method of claim 2039, wherein allowing the heat to transfer further comprises substantially uniformly increasing a permeability of a majority of the selected section.

2074. The method of claim 2039, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2075. The method of claim 2039, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2076. The method of claim 2039, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2077. The method of claim 2039, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat

sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2078. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to a selected section of the formation;

allowing the heat to transfer from the one or more heat sources to the selected section of the formation;

wherein at least a portion of the selected section has an initial moisture content of less than about 15%; and

producing a mixture from the formation.

2079. The method of claim 2078, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2080. The method of claim 2078, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2081. The method of claim 2078, wherein the one or more heat sources comprise electrical heaters.

2082. The method of claim 2078, wherein the one or more heat sources comprise surface burners.

2083. The method of claim 2078, wherein the one or more heat sources comprise flameless distributed combustors.

2084. The method of claim 2078, wherein the one or more heat sources comprise natural distributed combustors.

2085. The method of claim 2078, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2086. The method of claim 2078, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2087. The method of claim 2078, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2088. The method of claim 2078, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2089. The method of claim 2078, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2090. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2091. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2092. The method of claim 2078, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2093. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2094. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2095. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2096. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2097. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2098. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2099. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2100. The method of claim 2078, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2101. The method of claim 2078, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2102. The method of claim 2078, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2103. The method of claim 2078, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2104. The method of claim 2078, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2105. The method of claim 2078, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2106. The method of claim 2105, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2107. The method of claim 2078, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2108. The method of claim 2078, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2109. The method of claim 2078, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2110. The method of claim 2078, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2111. The method of claim 2078, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2112. The method of claim 2078, wherein allowing the heat to transfer further comprises substantially uniformly increasing a permeability of a majority of the selected section.

2113. The method of claim 2078, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2114. The method of claim 2078, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2115. The method of claim 2078, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2116. The method of claim 2078, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2117. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation;

wherein the selected section is heated in a reducing environment during at least a portion of the time that the selected section is being heated; and

producing a mixture from the formation.

2118. The method of claim 2117, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat

sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2119. The method of claim 2117, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2120. The method of claim 2117, wherein the one or more heat sources comprise electrical heaters.

2121. The method of claim 2117, wherein the one or more heat sources comprise surface burners.

2122. The method of claim 2117, wherein the one or more heat sources comprise flameless distributed combustors.

2123. The method of claim 2117, wherein the one or more heat sources comprise natural distributed combustors.

2124. The method of claim 2117, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2125. The method of claim 2117, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2126. The method of claim 2117, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2127. The method of claim 2117, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2128. The method of claim 2117, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2129. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2130. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2131. The method of claim 2117, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2132. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2133. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2134. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2135. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2136. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2137. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2138. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2139. The method of claim 2117, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2140. The method of claim 2117, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2141. The method of claim 2117, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2142. The method of claim 2117, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2143. The method of claim 2117, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2144. The method of claim 2117, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2145. The method of claim 2144, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2146. The method of claim 2117, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2147. The method of claim 2117, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2148. The method of claim 2117, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2149. The method of claim 2117, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2150. The method of claim 2117, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2151. The method of claim 2117, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2152. The method of claim 2117, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2153. The method of claim 2117, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2154. The method of claim 2117, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2155. The method of claim 2117, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat

sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2156. A method of treating a coal formation in situ, comprising:

heating a first section of the formation to produce a mixture from the formation;

heating a second section of the formation; and

recirculating a portion of the produced mixture from the first section into the second section of the formation to provide a reducing environment within the second section of the formation.

2157. The method of claim 2156, further comprising maintaining a temperature within the first section or the second section within a pyrolysis temperature range.

2158. The method of claim 2156, wherein heating the first or the second section comprises heating with an electrical heater.

2159. The method of claim 2156, wherein heating the first or the second section comprises heating with a surface burner.

2160. The method of claim 2156, wherein heating the first or the second section comprises heating with a flameless distributed combustor.

2161. The method of claim 2156, wherein heating the first or the second section comprises heating with a natural distributed combustor.

2162. The method of claim 2156, further comprising controlling a pressure and a temperature within at least a majority of the first or second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2163. The method of claim 2156, further comprising controlling the heat such that an average heating rate of the first or the second section is less than about 1 °C per day during pyrolysis.

2164. The method of claim 2156, wherein heating the first or the second section comprises:

heating a selected volume (V) of the coal formation from one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2165. The method of claim 2156, wherein heating the first or the second section comprises transferring heat substantially by conduction.

2166. The method of claim 2156, wherein heating the first or the second section comprises heating the first or the second section such that a thermal conductivity of at least a portion of the first or the second section is greater than about 0.5 W/(m °C).

2167. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2168. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2169. The method of claim 2156, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2170. The method of claim 2156. wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2171. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2172. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2173. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2174. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2175. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2176. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2177. The method of claim 2156, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2178. The method of claim 2156, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2179. The method of claim 2156, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2180. The method of claim 2156, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2181. The method of claim 2156, further comprising controlling a pressure within at least a majority of the first or second section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2182. The method of claim 2156, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2183. The method of claim 2182, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2184. The method of claim 2156, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2185. The method of claim 2156, further comprising:

providing hydrogen (H_2) to the first or second section to hydrogenate hydrocarbons within the first or second section; and

heating a portion of the first or second section with heat from hydrogenation.

2186. The method of claim 2156, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2187. The method of claim 2156, wherein heating the first or the second section comprises increasing a permeability of a majority of the first or the second section to greater than about 100 millidarcy.

2188. The method of claim 2156, wherein heating the first or the second section comprises substantially uniformly increasing a permeability of a majority of the first or the second section.

2189. The method of claim 2156, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2190. The method of claim 2156, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2191. The method of claim 2156, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat

sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2192. The method of claim 2156, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2193. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation; and

allowing the heat to transfer from the one or more heat sources to a selected section of the formation such that a permeability of at least a portion of the selected section increases to greater than about 100 millidarcy.

2194. The method of claim 2193, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2195. The method of claim 2193, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2196. The method of claim 2193, wherein the one or more heat sources comprise electrical heaters.

2197. The method of claim 2193, wherein the one or more heat sources comprise surface burners.

2198. The method of claim 2193, wherein the one or more heat sources comprise flameless distributed combustors.

2199. The method of claim 2193, wherein the one or more heat sources comprise natural distributed combustors.

2200. The method of claim 2193, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2201. The method of claim 2193, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2202. The method of claim 2193, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2203. The method of claim 2193, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2204. The method of claim 2193, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2205. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2206. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2207. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2208. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2209. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2210. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and

wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2211. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2212. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2213. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2214. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2215. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2216. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component,

wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2217. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2218. The method of claim 2193, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2219. The method of claim 2193, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2220. The method of claim 2193, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2221. The method of claim 2220, further comprising producing a mixture from the formation, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2222. The method of claim 2193, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2223. The method of claim 2193, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2224. The method of claim 2193, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2225. The method of claim 2193, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2226. The method of claim 2193, further comprising increasing a permeability of a majority of the selected section to greater than about 5 Darcy.

2227. The method of claim 2193, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2228. The method of claim 2193, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2229. The method of claim 2193, further comprising producing a mixture in a production well, wherein at least about 7 heat sources are disposed in the formation for each production well.

2230. The method of claim 2193, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2231. The method of claim 2193, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat

sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2232. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation; and

allowing the heat to transfer from the one or more heat sources to a selected section of the formation such that a permeability of a majority of at least a portion of the selected section increases substantially uniformly.

2233. The method of claim 2232, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2234. The method of claim 2232, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2235. The method of claim 2232, wherein the one or more heat sources comprise electrical heaters.

2236. The method of claim 2232, wherein the one or more heat sources comprise surface burners.

2237. The method of claim 2232, wherein the one or more heat sources comprise flameless distributed combustors.

2238. The method of claim 2232, wherein the one or more heat sources comprise natural distributed combustors.

2239. The method of claim 2232, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2240. The method of claim 2232, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2241. The method of claim 2232, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than *Pwr*, wherein *Pwr* is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein *Pwr* is the heating energy/day, *h* is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2242. The method of claim 2232, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2243. The method of claim 2232, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2244. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2245. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2246. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2247. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2248. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2249. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2250. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2251. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2252. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2253. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2254. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2255. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2256. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2257. The method of claim 2232, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2258. The method of claim 2232, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2259. The method of claim 2232, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2260. The method of claim 2232, further comprising producing a mixture from the formation, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2261. The method of claim 2232, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2262. The method of claim 2232, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2263. The method of claim 2232, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2264. The method of claim 2232, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2265. The method of claim 2232, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2266. The method of claim 2232, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2267. The method of claim 2232, further comprising producing a mixture in a production well, wherein at least about 7 heat sources are disposed in the formation for each production well.

2268. The method of claim 2232, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2269. The method of claim 2232, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2270. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation; and

allowing the heat to transfer from the one or more heat sources to a selected section of the formation such that a porosity of a majority of at least a portion of the selected section increases substantially uniformly.

2271. The method of claim 2270, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2272. The method of claim 2270, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2273. The method of claim 2270, wherein the one or more heat sources comprise electrical heaters.

2274. The method of claim 2270, wherein the one or more heat sources comprise surface burners.

2275. The method of claim 2270, wherein the one or more heat sources comprise flameless distributed combustors.

2276. The method of claim 2270, wherein the one or more heat sources comprise natural distributed combustors.

2277. The method of claim 2270, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2278. The method of claim 2270, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2279. The method of claim 2270, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2280. The method of claim 2270, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2281. The method of claim 2270, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2282. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2283. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2284. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and

wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2285. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2286. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2287. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2288. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2289. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2290. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and

wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2291. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2292. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2293. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2294. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2295. The method of claim 2270, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2296. The method of claim 2270, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2297. The method of claim 2270, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2298. The method of claim 2193, further comprising producing a mixture from the formation, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2299. The method of claim 2193, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2300. The method of claim 2193, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2301. The method of claim 2270, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2302. The method of claim 2270, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2303. The method of claim 2270, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2304. The method of claim 2270, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2305. The method of claim 2270, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2306. The method of claim 2270, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2307. The method of claim 2270, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2308. The method of claim 2270, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2309. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

controlling the heat to yield at least about 15 % by weight of a total organic carbon content of at least some of the coal formation into condensable hydrocarbons.

2310. The method of claim 2309, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat

sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2311. The method of claim 2309, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2312. The method of claim 2309, wherein the one or more heat sources comprise electrical heaters.

2313. The method of claim 2309, wherein the one or more heat sources comprise surface burners.

2314. The method of claim 2309, wherein the one or more heat sources comprise flameless distributed combustors.

2315. The method of claim 2309, wherein the one or more heat sources comprise natural distributed combustors.

2316. The method of claim 2309, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2317. The method of claim 2309, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2318. The method of claim 2309, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2319. The method of claim 2309, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2320. The method of claim 2309, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2321. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2322. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2323. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2324. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2325. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2326. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2327. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2328. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2329. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2330. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2331. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2332. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2333. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2334. The method of claim 2309, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2335. The method of claim 2309, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2336. The method of claim 2309, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2337. The method of claim 2309, further comprising producing a mixture from the formation, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2338. The method of claim 2309, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2339. The method of claim 2309, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2340. The method of claim 2309, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2341. The method of claim 2309, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2342. The method of claim 2309, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2343. The method of claim 2309, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2344. The method of claim 2309, wherein the heating is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2345. The method of claim 2309, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2346. The method of claim 2309, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2347. The method of claim 2309, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2348. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2349. The method of claim 2348, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2350. The method of claim 2348, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2351. The method of claim 2348, wherein the one or more heat sources comprise electrical heaters.

2352. The method of claim 2348, wherein the one or more heat sources comprise surface burners.

2353. The method of claim 2348, wherein the one or more heat sources comprise flameless distributed combustors.

2354. The method of claim 2348, wherein the one or more heat sources comprise natural distributed combustors.

2355. The method of claim 2348, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2356. The method of claim 2348, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2357. The method of claim 2348, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2358. The method of claim 2348, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2359. The method of claim 2348, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2360. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2361. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2362. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2363. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2364. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2365. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2366. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols..

2367. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2368. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2369. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2370. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2371. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2372. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2373. The method of claim 2348, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2374. The method of claim 2348, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2375. The method of claim 2348, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2376. The method of claim 2348, further comprising producing a mixture from the formation, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2377. The method of claim 2348, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2378. The method of claim 2348, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2379. The method of claim 2348, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section: and

heating a portion of the section with heat from hydrogenation.

2380. The method of claim 2348, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2381. The method of claim 2348, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2382. The method of claim 2348, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2383. The method of claim 2348, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2384. The method of claim 2348, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat

sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2385. The method of claim 2348, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2386. A method of treating a coal formation in situ, comprising:

heating a first section of the formation to pyrolyze at least some hydrocarbons in the first section and produce a first mixture from the formation;

heating a second section of the formation to pyrolyze at least some hydrocarbons in the second section and produce a second mixture from the formation; and

leaving an unpyrolyzed section between the first section and the second section to inhibit subsidence of the formation.

2387. The method of claim 2386, further comprising maintaining a temperature within the first section or the second section within a pyrolysis temperature range.

2388. The method of claim 2386, wherein heating the first section or heating the second section comprises heating with an electrical heater.

2389. The method of claim 2386, wherein heating the first section or heating the second section comprises heating with a surface burner.

2390. The method of claim 2386, wherein heating the first section or heating the second section comprises heating with a flameless distributed combustor.

2391. The method of claim 2386, wherein heating the first section or heating the second section comprises heating with a natural distributed combustor.

2392. The method of claim 2386, further comprising controlling a pressure and a temperature within at least a majority of the first or second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2393. The method of claim 2386, further comprising controlling the heat such that an average heating rate of the first or second section is less than about 1 °C per day during pyrolysis.

2394. The method of claim 2386, wherein heating the first section or heating the second section comprises:

heating a selected volume (V) of the coal formation from one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2395. The method of claim 2386, wherein heating the first section or heating the second section comprises transferring heat substantially by conduction.

2396. The method of claim 2386, wherein heating the first section or heating the second section comprises heating the formation such that a thermal conductivity of at least a portion of the first or second section, respectively, is greater than about 0.5 W/(m °C).

2397. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2398. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2399. The method of claim 2386, wherein the first or second mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2400. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2401. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2402. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2403. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2404. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2405. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2406. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2407. The method of claim 2386, wherein the first or second mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2408. The method of claim 2386, wherein the first or second mixture comprises a non-condensable component, and wherein the non-condensable component comprises hydrogen, and wherein the hydrogen is greater than about 10 % by volume of the non-condensable component and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2409. The method of claim 2386, wherein the first or second mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the first or second mixture is ammonia.

2410. The method of claim 2386, wherein the first or second mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2411. The method of claim 2386, further comprising controlling a pressure within at least a majority of the first or second section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2412. The method of claim 2386, further comprising controlling formation conditions to produce the first or second mixture, wherein a partial pressure of H_2 within the first or second mixture is greater than about 0.5 bar.

2413. The method of claim 2386, wherein a partial pressure of H_2 within the first or second mixture is measured when the first or second mixture is at a production well.

2414. The method of claim 2386, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2415. The method of claim 2386, further comprising controlling formation conditions by recirculating a portion of hydrogen from the first or second mixture into the formation.

2416. The method of claim 2386, further comprising:

providing hydrogen (H_2) to the first or second section to hydrogenate hydrocarbons within the first or second section, respectively; and

heating a portion of the first or second section, respectively, with heat from hydrogenation.

2417. The method of claim 2386, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2418. The method of claim 2386, wherein heating the first section or heating the second section comprises increasing a permeability of a majority of the first or second section, respectively, to greater than about 100 millidarcy.

2419. The method of claim 2386, wherein heating the first section or heating the second section comprises substantially uniformly increasing a permeability of a majority of the first or second section, respectively.

2420. The method of claim 2386, further comprising controlling heating of the first or second section to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay, from the first or second section, respectively.

2421. The method of claim 2386, wherein producing the first or second mixture comprises producing the first or second mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2422. The method of claim 2386, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2423. The method of claim 2386, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2424. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation through one or more production wells, wherein the heating is controlled such that the mixture can be produced from the

formation as a vapor, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2425. The method of claim 2424, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2426. The method of claim 2424, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2427. The method of claim 2424, wherein the one or more heat sources comprise electrical heaters.

2428. The method of claim 2424, wherein the one or more heat sources comprise surface burners.

2429. The method of claim 2424, wherein the one or more heat sources comprise flameless distributed combustors.

2430. The method of claim 2424, wherein the one or more heat sources comprise natural distributed combustors.

2431. The method of claim 2424, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2432. The method of claim 2424, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2433. The method of claim 2424, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2434. The method of claim 2424, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2435. The method of claim 2424, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2436. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2437. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2438. The method of claim 2424, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2439. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2440. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2441. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2442. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2443. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2444. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2445. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2446. The method of claim 2424, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2447. The method of claim 2424, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2448. The method of claim 2424, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2449. The method of claim 2424, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2450. The method of claim 2424, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2451. The method of claim 2424, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2452. The method of claim 2452, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2453. The method of claim 2424, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2454. The method of claim 2424, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2455. The method of claim 2424, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2456. The method of claim 2424, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2457. The method of claim 2424, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2458. The method of claim 2424, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2459. The method of claim 2424, wherein the heating is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2460. The method of claim 2424, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2461. The method of claim 2424, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat

sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2462. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation, wherein the one or more heat sources are disposed within one or more first wells;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation through one or more second wells, wherein one or more of the first or second wells are initially used for a first purpose and are then used for one or more other purposes.

2463. The method of claim 2462, wherein the first purpose comprises removing water from the formation, and wherein the second purpose comprises providing heat to the formation.

2464. The method of claim 2462, wherein the first purpose comprises removing water from the formation, and wherein the second purpose comprises producing the mixture.

2465. The method of claim 2462, wherein the first purpose comprises heating, and wherein the second purpose comprises removing water from the formation.

2466. The method of claim 2462, wherein the first purpose comprises producing the mixture, and wherein the second purpose comprises removing water from the formation.

2467. The method of claim 2462, wherein the one or more heat sources comprise electrical heaters.

2468. The method of claim 2462, wherein the one or more heat sources comprise surface burners.

2469. The method of claim 2462, wherein the one or more heat sources comprise flameless distributed combustors.

2470. The method of claim 2462, wherein the one or more heat sources comprise natural distributed combustors.

2471. The method of claim 2462, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2472. The method of claim 2462, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1.0 ° C per day during pyrolysis.

2473. The method of claim 2462, wherein providing heat from the one or more heat sources to at least the portion of the formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2474. The method of claim 2462, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2475. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2476. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2477. The method of claim 2462, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2478. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2479. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2480. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2481. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2482. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2483. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2484. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2485. The method of claim 2462, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2486. The method of claim 2462, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2487. The method of claim 2462, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2488. The method of claim 2462, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2489. The method of claim 2462, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2490. The method of claim 2462, further comprising controlling formation conditions to produce a mixture of condensable hydrocarbons and H_2, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2491. The method of claim 2490, wherein the partial pressure of H_2 is measured when the mixture is at a production well.

2492. The method of claim 2462, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2493. The method of claim 2462, further comprising controlling formation conditions, wherein controlling formation conditions comprises recirculating a portion of hydrogen from the mixture into the formation.

2494. The method of claim 2462, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2495. The method of claim 2462, wherein the produced mixture comprises hydrogen and condensable hydrocarbons, the method further comprising hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2496. The method of claim 2462, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2497. The method of claim 2462, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2498. The method of claim 2462, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2499. The method of claim 2462, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2500. The method of claim 2462, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2501. The method of claim 2462, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2502. A method for forming heater wells in a coal formation, comprising:

forming a first wellbore in the formation;

forming a second wellbore in the formation using magnetic tracking such that the second wellbore is arranged substantially parallel to the first wellbore; and

providing at least one heating mechanism within the first wellbore and at least one heating mechanism within the second wellbore such that the heating mechanisms can provide heat to at least a portion of the formation.

2503. The method of claim 2502, wherein superposition of heat from the at least one heating mechanism within the first wellbore and the at least one heating mechanism within the second wellbore pyrolyzes at least some hydrocarbons within a selected section of the formation.

2504. The method of claim 2502, further comprising maintaining a temperature within a selected section within a pyrolysis temperature range.

2505. The method of claim 2502, wherein the heating mechanisms comprise electrical heaters.

2506. The method of claim 2502, wherein the heating mechanisms comprise surface burners.

2507. The method of claim 2502, wherein the heating mechanisms comprise flameless distributed combustors.

2508. The method of claim 2502, wherein the heating mechanisms comprise natural distributed combustors.

2509. The method of claim 2502, further comprising controlling a pressure and a temperature within at least a majority of a selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2510. The method of claim 2502, further comprising controlling the heat from the heating mechanisms such that heat transferred from the heating mechanisms to at least the portion of the hydrocarbons is less than about 1 °C per day during pyrolysis.

2511. The method of claim 2502, further comprising:

heating a selected volume (V) of the coal formation from the heating mechanisms, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2512. The method of claim 2502, further comprising allowing the heat to transfer from the heating mechanisms to at least the portion of the formation substantially by conduction.

2513. The method of claim 2502, further comprising providing heat from the heating mechanisms to at least the portion of the formation such that a thermal conductivity of at least the portion of the formation is greater than about 0.5 W/(m °C).

2514. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2515. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2516. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2517. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2518. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2519. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2520. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2521. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2522. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2523. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2524. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2525. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2526. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2527. The method of claim 2502, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2528. The method of claim 2502, further comprising controlling a pressure within at least a majority of a selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2529. The method of claim 2528, wherein the partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2530. The method of claim 2502, further comprising producing a mixture from the formation, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2531. The method of claim 2502, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2532. The method of claim 2502, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2533. The method of claim 2502, further comprising:

providing hydrogen (H_2) to the portion to hydrogenate hydrocarbons within the formation; and

heating a portion of the formation with heat from hydrogenation.

2534. The method of claim 2502, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2535. The method of claim 2502, further comprising allowing heat to transfer from the heating mechanisms to a selected section of the formation to pyrolyze at least some hydrocarbons within the selected section such that a permeability of a majority of a selected section of the formation increases to greater than about 100 millidarcy.

2536. The method of claim 2502, further comprising allowing heat to transfer from the heating mechanisms to a selected section of the formation to pyrolyze at least some hydrocarbons within the selected section such that a permeability of a majority of the selected section increases substantially uniformly.

2537. The method of claim 2502, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2538. The method of claim 2502, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2539. The method of claim 2502, further comprising forming a production well in the formation using magnetic tracking such that the production well is substantially parallel to the first wellbore and coupling a wellhead to the third wellbore.

2540. The method of claim 2502, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2541. The method of claim 2502, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2542. A method for installing a heater well into a coal formation, comprising:

forming a bore in the ground using a steerable motor and an accelerometer; and

providing a heating mechanism within the bore such that the heating mechanism can transfer heat to at least a portion of the formation.

2543. The method of claim 2542, further comprising installing at least two heater wells, and wherein superposition of heat from at least the two heater wells pyrolyzes at least some hydrocarbons within a selected section of the formation.

2544. The method of claim 2542, further comprising maintaining a temperature within a selected section within a pyrolysis temperature range.

2545. The method of claim 2542, wherein the heating mechanism comprises an electrical heater.

2546. The method of claim 2542, wherein the heating mechanism comprises a surface burner.

2547. The method of claim 2542, wherein the heating mechanism comprises a flameless distributed combustor.

2548. The method of claim 2542, wherein the heating mechanism comprises a natural distributed combustor.

2549. The method of claim 2542, further comprising controlling a pressure and a temperature within at least a majority of a selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2550. The method of claim 2542, further comprising controlling the heat from the heating mechanism such that heat transferred from the heating mechanism to at least the portion of the formation is less than about 1 °C per day during pyrolysis.

2551. The method of claim 2542, further comprising:

heating a selected volume (V) of the coal formation from the heating mechanism, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2552. The method of claim 2542, further comprising allowing the heat to transfer from the heating mechanism to at least the portion of the formation substantially by conduction.

2553. The method of claim 2542, further comprising providing heat from the heating mechanism to at least the portion of the formation such that a thermal conductivity of at least the portion of the formation is greater than about 0.5 W/(m °C).

2554. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2555. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2556. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2557. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2558. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and

wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2559. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2560. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2561. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2562. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2563. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2564. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and

wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2565. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2566. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2567. The method of claim 2542, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2568. The method of claim 2542, further comprising controlling a pressure within at least a majority of a selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2569. The method of claim 2542, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2570. The method of claim 2569, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2571. The method of claim 2542, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2572. The method of claim 2542, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2573. The method of claim 2542, further comprising:

providing hydrogen (H_2) to the at least the heated portion to hydrogenate hydrocarbons within the formation; and

heating a portion of the formation with heat from hydrogenation.

2574. The method of claim 2542, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2575. The method of claim 2542, further comprising allowing heat to transfer from the heating mechanism to a selected section of the formation to pyrolyze at least some hydrocarbons within the selected section such that a permeability of a majority of a selected section of the formation increases to greater than about 100 millidarcy.

2576. The method of claim 2542, further comprising allowing heat to transfer from the heating mechanism to a selected section of the formation to pyrolyze at least some hydrocarbons within the selected section such that a permeability of a majority of the selected section increases substantially uniformly.

2577. The method of claim 2542, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2578. The method of claim 2542, further comprising producing a mixture in a production well, and wherein at least about 7 heating mechanisms are disposed in the formation for each production well.

2579. The method of claim 2542, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2580. The method of claim 2542, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2581. A method for installing of wells in a coal formation, comprising:

forming a wellbore in the formation by geosteered drilling; and

providing a heating mechanism within the wellbore such that the heating mechanism can transfer heat to at least a portion of the formation.

2582. The method of claim 2581, further comprising maintaining a temperature within a selected section within a pyrolysis temperature range.

2583. The method of claim 2581, wherein the heating mechanism comprises an electrical heater.

2584. The method of claim 2581, wherein the heating mechanism comprises a surface burner.

2585. The method of claim 2581, wherein the heating mechanism comprises a flameless distributed combustor.

2586. The method of claim 2581, wherein the heating mechanism comprises a natural distributed combustor.

2587. The method of claim 2581, further comprising controlling a pressure and a temperature within at least a majority of a selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2588. The method of claim 2581, further comprising controlling the heat from the heating mechanism such that heat transferred from the heating mechanism to at least the portion of the formation is less than about 1 °C per day during pyrolysis.

2589. The method of claim 2581, further comprising:

heating a selected volume (V) of the coal formation from the heating mechanism, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2590. The method of claim 2581, further comprising allowing the heat to transfer from the heating mechanism to at least the portion of the formation substantially by conduction.

2591. The method of claim 2581, further comprising providing heat from the heating mechanism to at least the portion of the formation such that a thermal conductivity of at least the portion of the formation is greater than about 0.5 W/(m °C).

2592. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2593. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2594. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2595. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2596. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2597. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2598. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein

about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2599. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2600. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2601. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2602. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2603. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2604. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2605. The method of claim 2581, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2606. The method of claim 2581, further comprising controlling a pressure within at least a majority of a selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2607. The method of claim 2581, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2608. The method of claim 2607, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2609. The method of claim 2581, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2610. The method of claim 2581, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2611. The method of claim 2581, further comprising:

providing hydrogen (H_2) to at least the heated portion to hydrogenate hydrocarbons within the formation; and

heating a portion of the formation with heat from hydrogenation.

2612. The method of claim 2581, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2613. The method of claim 2581, further comprising allowing heat to transfer from the heating mechanism to a selected section of the formation to pyrolyze at least some hydrocarbons within the selected section such that a permeability of a majority of a selected section of the formation increases to greater than about 100 millidarcy.

2614. The method of claim 2581, further comprising allowing heat to transfer from the heating mechanism to a selected section of the formation to pyrolyze at least some hydrocarbons within the selected section such that a permeability of a majority of the selected section increases substantially uniformly.

2615. The method of claim 2581, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2616. The method of claim 2581, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2617. The method of claim 2581, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2618. The method of claim 2581, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat

sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2619. A method of treating a coal formation in situ, comprising:

heating a selected section of the formation with a heating element placed within a wellbore, wherein at least one end of the heating element is free to move axially within the wellbore to allow for thermal expansion of the heating element.

2620. The method of claim 2619, further comprising at least two heating elements within at least two wellbores, and wherein superposition of heat from at least the two heating elements pyrolyzes at least some hydrocarbons within a selected section of the formation.

2621. The method of claim 2619, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2622. The method of claim 2619, wherein the heating element comprises a pipe-in-pipe heater.

2623. The method of claim 2619, wherein the heating element comprises a flameless distributed combustor.

2624. The method of claim 2619, wherein the heating element comprises a mineral insulated cable coupled to a support, and wherein the support is free to move within the wellbore.

2625. The method of claim 2619, wherein the heating element comprises a mineral insulated cable suspended from a wellhead.

2626. The method of claim 2619, further comprising controlling a pressure and a temperature within at least a majority of a heated section of the formation, wherein the

pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2627. The method of claim 2619, further comprising controlling the heat such that an average heating rate of the heated section is less than about 1 °C per day during pyrolysis.

2628. The method of claim 2619, wherein heating the section of the formation further comprises:

heating a selected volume (V) of the coal formation from the heating element, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2629. The method of claim 2619, wherein heating the section of the formation comprises transferring heat substantially by conduction.

2630. The method of claim 2619, further comprising heating the selected section of the formation such that a thermal conductivity of the selected section is greater than about 0.5 W/(m °C).

2631. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2632. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and

wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2633. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2634. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2635. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2636. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2637. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2638. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and

wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2639. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2640. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2641. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2642. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2643. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2644. The method of claim 2619, further comprising producing a mixture from the formation, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2645. The method of claim 2619, further comprising controlling a pressure within the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2646. The method of claim 2619, further comprising controlling formation conditions to produce a mixture from the formation, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2647. The method of claim 2647, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2648. The method of claim 2619, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2649. The method of claim 2619, further comprising producing a mixture from the formation and controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2650. The method of claim 2619, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the heated section; and

heating a portion of the section with heat from hydrogenation.

2651. The method of claim 2619, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2652. The method of claim 2619, wherein heating comprises increasing a permeability of a majority of the heated section to greater than about 100 millidarcy.

2653. The method of claim 2619, wherein heating comprises substantially uniformly increasing a permeability of a majority of the heated section.

2654. The method of claim 2619, wherein the heating is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2655. The method of claim 2619, further comprising producing a mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2656. The method of claim 2619, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2657. The method of claim 2619, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2658. A method of treating a coal formation in situ, comprising:

providing heat from one or more heat sources to at least a portion of the formation;

allowing the heat to transfer from the one or more heat sources to a selected section of the formation; and

producing a mixture from the formation through a production well, wherein the production well is located such that a majority of the mixture produced from the

formation comprises non-condensable hydrocarbons and a non-condensable component comprising hydrogen.

2659. The method of claim 2658, wherein the one or more heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2660. The method of claim 2658, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2661. The method of claim 2658, wherein the production well is less than approximately 6 m from a heat source of the one or more heat sources.

2662. The method of claim 2658, wherein the production well is less than approximately 3 m from a heat source of the one or more heat sources.

2663. The method of claim 2658, wherein the production well is less than approximately 1.5 m from a heat source of the one or more heat sources.

2664. The method of claim 2658, wherein an additional heat source is positioned within a wellbore of the production well.

2665. The method of claim 2658, wherein the one or more heat sources comprise electrical heaters.

2666. The method of claim 2658, wherein the one or more heat sources comprise surface burners.

2667. The method of claim 2658, wherein the one or more heat sources comprise flameless distributed combustors.

2668. The method of claim 2658, wherein the one or more heat sources comprise natural distributed combustors.

2669. The method of claim 2658, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2670. The method of claim 2658, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2671. The method of claim 2658, wherein providing heat from the one or more heat sources to at least the portion of formation comprises:

heating a selected volume (V) of the coal formation from the one or more heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2672. The method of claim 2658, wherein allowing the heat to transfer from the one or more heat sources to the selected section comprises transferring heat substantially by conduction.

2673. The method of claim 2658, wherein providing heat from the one or more heat sources comprises heating the selected section such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2674. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2675. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2676. The method of claim 2658, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2677. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2678. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2679. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2680. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2681. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2682. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2683. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2684. The method of claim 2658, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2685. The method of claim 2658, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2686. The method of claim 2658, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2687. The method of claim 2658, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2688. The method of claim 2658, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2689. The method of claim 2658, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2690. The method of claim 2689, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2691. The method of claim 2658, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2692. The method of claim 2658, further comprising controlling formation conditions by recirculating a portion of the hydrogen from the mixture into the formation.

2693. The method of claim 2658, further comprising:

providing hydrogen (H_2) to the heated section to hydrogenate hydrocarbons within the section; and

heating a portion of the section with heat from hydrogenation.

2694. The method of claim 2658, further comprising:

producing condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2695. The method of claim 2658, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2696. The method of claim 2658, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2697. The method of claim 2658, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2698. The method of claim 2658, wherein producing the mixture comprises producing the mixture in a production well, and wherein at least about 7 heat sources are disposed in the formation for each production well.

2699. The method of claim 2658, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2700. The method of claim 2658, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2701. A method of treating a coal formation in situ, comprising:

providing heat to at least a portion of the formation from one or more first heat sources placed within a pattern in the formation;

allowing the heat to transfer from the one or more first heat sources to a first section of the formation;

heating a second section of the formation with at least one second heat source, wherein the second section is located within the first section, and wherein at least the one second heat source is configured to raise an average temperature of a portion of the second section to a higher temperature than an average temperature of the first section; and

producing a mixture from the formation through a production well positioned within the second section, wherein a majority of the produced mixture comprises non-

condensable hydrocarbons and a non-condensable component comprising H_2 components.

2702. The method of claim 2701, wherein the one or more first heat sources comprise at least two heat sources, and wherein superposition of heat from at least the two heat sources pyrolyzes at least some hydrocarbons within the first section of the formation.

2703. The method of claim 2701, further comprising maintaining a temperature within the first section within a pyrolysis temperature range.

2704. The method of claim 2701, wherein at least the one heat source comprises a heater element positioned within the production well.

2705. The method of claim 2701, wherein at least the one second heat source comprises an electrical heater.

2706. The method of claim 2701, wherein at least the one second heat source comprises a surface burner.

2707. The method of claim 2701, wherein at least the one second heat source comprises a flameless distributed combustor.

2708. The method of claim 2701, wherein at least the one second heat source comprises a natural distributed combustor.

2709. The method of claim 2701, further comprising controlling a pressure and a temperature within at least a majority of the first or the second section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2710. The method of claim 2701, further comprising controlling the heat such that an average heating rate of the first section is less than about 1 °C per day during pyrolysis.

2711. The method of claim 2701, wherein providing heat to the formation further comprises:

heating a selected volume (V) of the from the one or more first heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2712. The method of claim 2701, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2713. The method of claim 2701, wherein providing heat from the one or more first heat sources comprises heating the first section such that a thermal conductivity of at least a portion of the first section is greater than about 0.5 W/(m °C).

2714. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2715. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2716. The method of claim 2701, wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2717. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2718. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2719. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2720. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2721. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2722. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2723. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2724. The method of claim 2701, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2725. The method of claim 2701, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2726. The method of claim 2701, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2727. The method of claim 2701, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2728. The method of claim 2701, further comprising controlling a pressure within at least a majority of the first or the second section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2729. The method of claim 2701, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2730. The method of claim 2729, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2731. The method of claim 2701, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2732. The method of claim 2701, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2733. The method of claim 2701, further comprising:

providing hydrogen (H_2) to the first or second section to hydrogenate hydrocarbons within the first or second section, respectively; and

heating a portion of the first or second section, respectively, with heat from hydrogenation.

2734. The method of claim 2701, further comprising:

producing condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2735. The method of claim 2701, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the first or second section to greater than about 100 millidarcy.

2736. The method of claim 2701, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the first or second section.

2737. The method of claim 2701, wherein heating the first or the second section is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2738. The method of claim 2701, wherein at least about 7 heat sources are disposed in the formation for each production well.

2739. The method of claim 2701, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat

sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2740. The method of claim 2701, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2741. A method of treating a coal formation in situ, comprising:

providing heat into the formation from a plurality of heat sources placed in a pattern within the formation, wherein a spacing between heat sources is greater than about 6 m;

allowing the heat to transfer from the plurality of heat sources to a selected section of the formation;

producing a mixture from the formation from a plurality of production wells, wherein the plurality of production wells are positioned within the pattern, and wherein a spacing between production wells is greater than about 12 m.

2742. The method of claim 2741, wherein superposition of heat from the plurality of heat sources pyrolyzes at least some hydrocarbons within the selected section of the formation.

2743. The method of claim 2741, further comprising maintaining a temperature within the selected section within a pyrolysis temperature range.

2744. The method of claim 2741, wherein the plurality of heat sources comprises electrical heaters.

2745. The method of claim 2741, wherein the plurality of heat sources comprises surface burners.

2746. The method of claim 2741, wherein the plurality of heat sources comprises flameless distributed combustors.

2747. The method of claim 2741, wherein the plurality of heat sources comprises natural distributed combustors.

2748. The method of claim 2741, further comprising controlling a pressure and a temperature within at least a majority of the selected section of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

2749. The method of claim 2741, further comprising controlling the heat such that an average heating rate of the selected section is less than about 1 °C per day during pyrolysis.

2750. The method of claim 2741, wherein providing heat from the plurality of heat comprises:

heating a selected volume (V) of the coal formation from the plurality of heat sources, wherein the formation has an average heat capacity (C_v), and wherein the heating pyrolyzes at least some hydrocarbons within the selected volume of the formation; and

wherein heating energy/day provided to the volume is equal to or less than Pwr, wherein Pwr is calculated by the equation:

$$Pwr = h*V*C_v*\rho_B$$

wherein Pwr is the heating energy/day, h is an average heating rate of the formation, ρ_B is formation bulk density, and wherein the heating rate is less than about 10 °C/day.

2751. The method of claim 2741, wherein allowing the heat to transfer comprises transferring heat substantially by conduction.

2752. The method of claim 2741, wherein providing heat comprises heating the selected formation such that a thermal conductivity of at least a portion of the selected section is greater than about 0.5 W/(m °C).

2753. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons having an API gravity of at least about 25°.

2754. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 0.1 % by weight to about 15 % by weight of the condensable hydrocarbons are olefins.

2755. The method of claim 2741, wherein the produced mixture comprises non-condensable hydrocarbons, and wherein a molar ratio of ethene to ethane in the non-condensable hydrocarbons ranges from about 0.001 to about 0.15.

2756. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is nitrogen.

2757. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is oxygen.

2758. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 1 % by weight, when calculated on an atomic basis, of the condensable hydrocarbons is sulfur.

2759. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons comprise oxygen containing compounds, and wherein the oxygen containing compounds comprise phenols.

2760. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein greater than about 20 % by weight of the condensable hydrocarbons are aromatic compounds.

2761. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 5 % by weight of the condensable hydrocarbons comprises multi-ring aromatics with more than two rings.

2762. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein less than about 0.3 % by weight of the condensable hydrocarbons are asphaltenes.

2763. The method of claim 2741, wherein the produced mixture comprises condensable hydrocarbons, and wherein about 5 % by weight to about 30 % by weight of the condensable hydrocarbons are cycloalkanes.

2764. The method of claim 2741, wherein the produced mixture comprises a non-condensable component, wherein the non-condensable component comprises hydrogen, wherein the hydrogen is greater than about 10 % by volume of the non-condensable component, and wherein the hydrogen is less than about 80 % by volume of the non-condensable component.

2765. The method of claim 2741, wherein the produced mixture comprises ammonia, and wherein greater than about 0.05 % by weight of the produced mixture is ammonia.

2766. The method of claim 2741, wherein the produced mixture comprises ammonia, and wherein the ammonia is used to produce fertilizer.

2767. The method of claim 2741, further comprising controlling a pressure within at least a majority of the selected section of the formation, wherein the controlled pressure is at least about 2.0 bar absolute.

2768. The method of claim 2741, further comprising controlling formation conditions to produce the mixture, wherein a partial pressure of H_2 within the mixture is greater than about 0.5 bar.

2769. The method of claim 2768, wherein the partial pressure of H_2 within the mixture is measured when the mixture is at a production well.

2770. The method of claim 2741, further comprising altering a pressure within the formation to inhibit production of hydrocarbons from the formation having carbon numbers greater than about 25.

2771. The method of claim 2741, further comprising controlling formation conditions by recirculating a portion of hydrogen from the mixture into the formation.

2772. The method of claim 2741, further comprising:

providing hydrogen (H_2) to the selected section to hydrogenate hydrocarbons within the selected section; and

heating a portion of the selected section with heat from hydrogenation.

2773. The method of claim 2741, further comprising:

producing hydrogen and condensable hydrocarbons from the formation; and

hydrogenating a portion of the produced condensable hydrocarbons with at least a portion of the produced hydrogen.

2774. The method of claim 2741, wherein allowing the heat to transfer comprises increasing a permeability of a majority of the selected section to greater than about 100 millidarcy.

2775. The method of claim 2741, wherein allowing the heat to transfer comprises substantially uniformly increasing a permeability of a majority of the selected section.

2776. The method of claim 2741, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by Fischer Assay.

2777. The method of claim 2741, wherein at least about 7 heat sources are disposed in the formation for each production well.

2778. The method of claim 2741, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, and wherein the unit of heat sources comprises a triangular pattern.

2779. The method of claim 2741, further comprising providing heat from three or more heat sources to at least a portion of the formation, wherein three or more of the heat sources are located in the formation in a unit of heat sources, wherein the unit of heat sources comprises a triangular pattern, and wherein a plurality of the units are repeated over an area of the formation to form a repetitive pattern of units.

2780. A system configured to heat a coal formation, comprising:

a heater disposed in an opening in the formation, wherein the heater is configured to provide heat to at least a portion of the formation during use;

an oxidizing fluid source;

a conduit disposed in the opening, wherein the conduit is configured to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, and wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2781. The system of claim 2780, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2782. The system of claim 2780, wherein the conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

2783. The system of claim 2780, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2784. The system of claim 2780, wherein the conduit is further configured to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2785. The system of claim 2780, wherein the conduit is further configured to remove an oxidation product.

2786. The system of claim 2780, wherein the conduit is further configured to remove an oxidation product such that the oxidation product transfers substantial heat to the oxidizing fluid.

2787. The system of claim 2780, wherein the conduit is further configured to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2788. The system of claim 2780, wherein the conduit is further configured to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2789. The system of claim 2780, wherein the conduit is further configured to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2790. The system of claim 2780, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2791. The system of claim 2780, further comprising a center conduit disposed within the conduit, wherein the center conduit is configured to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configured to remove an oxidation product during use.

2792. The system of claim 2780, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2793. The system of claim 2780, further comprising a conductor disposed in a second conduit, wherein the second conduit is disposed within the opening, and wherein the conductor is configured to heat at least a portion of the formation during application of an electrical current to the conductor.

2794. The system of claim 2780, further comprising an insulated conductor disposed within the opening, wherein the insulated conductor is configured to heat at least a portion of the formation during application of an electrical current to the insulated conductor.

2795. The system of claim 2780, further comprising at least one elongated member disposed within the opening, wherein the at least the one elongated member is configured to heat at least a portion of the formation during application of an electrical current to the at least the one elongated member.

2796. The system of claim 2780, further comprising a heat exchanger disposed external to the formation, wherein the heat exchanger is configured to heat the oxidizing fluid, wherein the conduit is further configured to provide the heated oxidizing fluid into the opening during use, and wherein the heated oxidizing fluid is configured to heat at least a portion of the formation during use.

2797. The system of claim 2780, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2798. The system of claim 2780, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2799. The system of claim 2780, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2800. The system of claim 2780, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2801. The system of claim 2780, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2802. The system of claim 2780, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the

formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2803. The system of claim 2780, wherein the system is further configured such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2804. A system configurable to heat a coal formation, comprising:

a heater configurable to be disposed in an opening in the formation, wherein the heater is further configurable to provide heat to at least a portion of the formation during use;

a conduit configurable to be disposed in the opening, wherein the conduit is configurable to provide an oxidizing fluid from an oxidizing fluid source to a reaction zone in the formation during use, and wherein the system is configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2805. The system of claim 2804, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2806. The system of claim 2804, wherein the conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

2807. The system of claim 2804, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2808. The system of claim 2804, wherein the conduit is further configurable to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2809. The system of claim 2804, wherein the conduit is further configurable to remove an oxidation product.

2810. The system of claim 2804, wherein the conduit is further configurable to remove an oxidation product, such that the oxidation product transfers heat to the oxidizing fluid.

2811. The system of claim 2804, wherein the conduit is further configurable to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2812. The system of claim 2804, wherein the conduit is further configurable to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2813. The system of claim 2804, wherein the conduit is further configurable to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2814. The system of claim 2804, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2815. The system of claim 2804, further comprising a center conduit disposed within the conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configurable to remove an oxidation product during use.

2816. The system of claim 2804, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2817. The system of claim 2804, further comprising a conductor disposed in a second conduit, wherein the second conduit is disposed within the opening, and wherein the conductor is configurable to heat at least a portion of the formation during application of an electrical current to the conductor.

2818. The system of claim 2804, further comprising an insulated conductor disposed within the opening, wherein the insulated conductor is configurable to heat at least a portion of the formation during application of an electrical current to the insulated conductor.

2819. The system of claim 2804, further comprising at least one elongated member disposed within the opening, wherein the at least the one elongated member is configurable to heat at least a portion of the formation during application of an electrical current to the at least the one elongated member.

2820. The system of claim 2804, further comprising a heat exchanger disposed external to the formation, wherein the heat exchanger is configurable to heat the oxidizing fluid, wherein the conduit is further configurable to provide the heated oxidizing fluid into the opening during use, and wherein the heated oxidizing fluid is configurable to heat at least a portion of the formation during use.

2821. The system of claim 2804, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2822. The system of claim 2804, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2823. The system of claim 2804, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2824. The system of claim 2804, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2825. The system of claim 2804, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2826. The system of claim 2804, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2827. The system of claim 2804, wherein the system is further configurable such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2828. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

2829. The method of claim 2828, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

2830. The method of claim 2828, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

2831. The method of claim 2828, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

2832. The method of claim 2828, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

2833. The method of claim 2828, wherein a conduit is disposed in the opening, the method further comprising cooling the conduit with the oxidizing fluid to reduce heating of the conduit by oxidation.

2834. The method of claim 2828, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit.

2835. The method of claim 2828, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and transferring heat from the oxidation product in the conduit to oxidizing fluid in the conduit.

2836. The method of claim 2828, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through

the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2837. The method of claim 2828, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

2838. The method of claim 2828, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

2839. The method of claim 2828, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

2840. The method of claim 2828, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

2841. The method of claim 2828, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2842. The method of claim 2828, wherein heating the portion comprises applying electrical current to a conductor disposed in a conduit, wherein the conduit is disposed within the opening.

2843. The method of claim 2828, wherein heating the portion comprises applying electrical current to an insulated conductor disposed within the opening.

2844. The method of claim 2828, wherein heating the portion comprises applying electrical current to at least one elongated member disposed within the opening.

2845. The method of claim 2828, wherein heating the portion comprises heating the oxidizing fluid in a heat exchanger disposed external to the formation such that providing the oxidizing fluid into the opening comprises transferring heat from the heated oxidizing fluid to the portion.

2846. The method of claim 2828, further comprising removing water from the formation prior to heating the portion.

2847. The method of claim 2828, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

2848. The method of claim 2828, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2849. The method of claim 2828, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2850. The method of claim 2828, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2851. The method of claim 2828, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2852. The method of claim 2828, wherein the pyrolysis zone is substantially adjacent to the reaction zone.

2853. A system configured to heat a coal formation, comprising:

a heater disposed in an opening in the formation, wherein the heater is configured to provide heat to at least a portion of the formation during use;

an oxidizing fluid source;

a conduit disposed in the opening, wherein the conduit is configured to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone, and wherein the conduit is further configured to remove an oxidation product from the formation during use; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2854. The system of claim 2853, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2855. The system of claim 2853, wherein the conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

2856. The system of claim 2853, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2857. The system of claim 2853, wherein the conduit is further configured to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2858. The system of claim 2853, wherein the conduit is further configured such that the oxidation product transfers heat to the oxidizing fluid.

2859. The system of claim 2853, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2860. The system of claim 2853, wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2861. The system of claim 2853, wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2862. The system of claim 2853, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2863. The system of claim 2853, further comprising a center conduit disposed within the conduit, wherein the center conduit is configured to provide the oxidizing fluid into the opening during use.

2864. The system of claim 2853, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2865. The system of claim 2853, further comprising a conductor disposed in a second conduit, wherein the second conduit is disposed within the opening, and wherein the conductor is configured to heat at least a portion of the formation during application of an electrical current to the conductor.

2866. The system of claim 2853, further comprising an insulated conductor disposed within the opening, wherein the insulated conductor is configured to heat at least a

portion of the formation during application of an electrical current to the insulated conductor.

2867. The system of claim 2853, further comprising at least one elongated member disposed within the opening, wherein the at least the one elongated member is configured to heat at least a portion of the formation during application of an electrical current to the at least the one elongated member.

2868. The system of claim 2853, further comprising a heat exchanger disposed external to the formation, wherein the heat exchanger is configured to heat the oxidizing fluid, wherein the conduit is further configured to provide the heated oxidizing fluid into the opening during use, and wherein the heated oxidizing fluid is configured to heat at least a portion of the formation during use.

2869. The system of claim 2853, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2870. The system of claim 2853, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2871. The system of claim 2853, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2872. The system of claim 2853, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2873. The system of claim 2853, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2874. The system of claim 2853, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2875. The system of claim 2853, wherein the system is further configured such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2876. A system configurable to heat a coal formation, comprising:

a heater configurable to be disposed in an opening in the formation, wherein the heater is further configurable to provide heat to at least a portion of the formation during use;

a conduit configurable to be disposed in the opening, wherein the conduit is further configurable to provide an oxidizing fluid from an oxidizing fluid source to a reaction zone in the formation during use, wherein the system is configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone, and wherein the conduit is further configurable to remove an oxidation product from the formation during use; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone during use.

2877. The system of claim 2876, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2878. The system of claim 2876, wherein the conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

2879. The system of claim 2876, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2880. The system of claim 2876, wherein the conduit is further configurable to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2881. The system of claim 2876, wherein the conduit is further configurable such that the oxidation product transfers heat to the oxidizing fluid.

2882. The system of claim 2876, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2883. The system of claim 2876, wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2884. The system of claim 2876, wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2885. The system of claim 2876, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2886. The system of claim 2876, further comprising a center conduit disposed within the conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use.

2887. The system of claim 2876, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2888. The system of claim 2876, further comprising a conductor disposed in a second conduit, wherein the second conduit is disposed within the opening, and wherein the conductor is configurable to heat at least a portion of the formation during application of an electrical current to the conductor.

2889. The system of claim 2876, further comprising an insulated conductor disposed within the opening, wherein the insulated conductor is configurable to heat at least a portion of the formation during application of an electrical current to the insulated conductor.

2890. The system of claim 2876, further comprising at least one elongated member disposed within the opening, wherein the at least the one elongated member is configurable to heat at least a portion of the formation during application of an electrical current to the at least the one elongated member.

2891. The system of claim 2876, further comprising a heat exchanger disposed external to the formation, wherein the heat exchanger is configurable to heat the oxidizing fluid, wherein the conduit is further configurable to provide the heated oxidizing fluid into the opening during use, and wherein the heated oxidizing fluid is configurable to heat at least a portion of the formation during use.

2892. The system of claim 2876, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2893. The system of claim 2876, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2894. The system of claim 2876, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2895. The system of claim 2876, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2896. The system of claim 2876, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2897. The system of claim 2876, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2898. The system of claim 2876, wherein the system is further configurable such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2899. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein the portion is located substantially adjacent to an opening in the formation;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing gas to react with at least a portion of the hydrocarbons at the reaction zone to generate heat in the reaction zone;

removing at least a portion of an oxidation product through the opening; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

2900. The method of claim 2899, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

2901. The method of claim 2899, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

2902. The method of claim 2899, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

2903. The method of claim 2899, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially maintained within the reaction zone.

2904. The method of claim 2899, wherein a conduit is disposed in the opening, the method further comprising cooling the conduit with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2905. The method of claim 2899, wherein a conduit is disposed within the opening, and wherein removing at least the portion of the oxidation product through the opening comprises removing at least the portion of the oxidation product through the conduit.

2906. The method of claim 2899, wherein a conduit is disposed within the opening, and wherein removing at least the portion of the oxidation product through the opening comprises removing at least the portion of the oxidation product through the conduit, the method further comprising transferring substantial heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

2907. The method of claim 2899, wherein a conduit is disposed within the opening, wherein removing at least the portion of the oxidation product through the opening comprises removing at least the portion of the oxidation product through the conduit, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2908. The method of claim 2899, wherein a conduit is disposed within the opening, and wherein removing at least the portion of the oxidation product through the opening comprises removing at least the portion of the oxidation product through the conduit, the method further comprising controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

2909. The method of claim 2899, wherein a conduit is disposed within the opening, and wherein removing at least the portion of the oxidation product through the opening comprises removing at least the portion of the oxidation product through the conduit, the method further comprising substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

2910. The method of claim 2899, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

2911. The method of claim 2899, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing at least a portion of the oxidation product through the outer conduit.

2912. The method of claim 2899, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2913. The method of claim 2899, wherein heating the portion comprises applying electrical current to a conductor disposed in a conduit, wherein the conduit is disposed within the opening.

2914. The method of claim 2899, wherein heating the portion comprises applying electrical current to an insulated conductor disposed within the opening.

2915. The method of claim 2899, wherein heating the portion comprises applying electrical current to at least one elongated member disposed within the opening.

2916. The method of claim 2899, wherein heating the portion comprises heating the oxidizing fluid in a heat exchanger disposed external to the formation such that providing the oxidizing fluid into the opening comprises transferring heat from the heated oxidizing fluid to the portion.

2917. The method of claim 2899, further comprising removing water from the formation prior to heating the portion.

2918. The method of claim 2899, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

2919. The method of claim 2899, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2920. The method of claim 2899, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2921. The method of claim 2899, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2922. The method of claim 2899, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2923. The method of claim 2899, wherein the pyrolysis zone is substantially adjacent to the reaction.

2924. A system configured to heat a coal formation, comprising:

an electric heater disposed in an opening in the formation, wherein the electric heater is configured to provide heat to at least a portion of the formation during use;

an oxidizing fluid source;

a conduit disposed in the opening, wherein the conduit is configured to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, and wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2925. The system of claim 2924, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2926. The system of claim 2924, wherein the conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

2927. The system of claim 2924, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2928. The system of claim 2924, wherein the conduit is further configured to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2929. The system of claim 2924, wherein the conduit is further configured to remove an oxidation product.

2930. The system of claim 2924, wherein the conduit is further configured to remove an oxidation product, such that the oxidation product transfers heat to the oxidizing fluid.

2931. The system of claim 2924, wherein the conduit is further configured to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2932. The system of claim 2924, wherein the conduit is further configured to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2933. The system of claim 2924, wherein the conduit is further configured to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2934. The system of claim 2924, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2935. The system of claim 2924, further comprising a center conduit disposed within the conduit, wherein the center conduit is configured to provide the oxidizing fluid into

the opening during use, and wherein the conduit is further configured to remove an oxidation product during use.

2936. The system of claim 2924, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2937. The system of claim 2924, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2938. The system of claim 2924, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2939. The system of claim 2924, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2940. The system of claim 2924, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2941. The system of claim 2924, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2942. The system of claim 2924, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the

formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2943. The system of claim 2924, wherein the system is further configured such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2944. A system configurable to heat a coal formation, comprising:

an electric heater configurable to be disposed in an opening in the formation, wherein the electric heater is further configurable to provide heat to at least a portion of the formation during use, and wherein at least the portion is located substantially adjacent to the opening;

a conduit configurable to be disposed in the opening, wherein the conduit is further configurable to provide an oxidizing fluid from an oxidizing fluid source to a reaction zone in the formation during use, and wherein the system is configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2945. The system of claim 2944, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2946. The system of claim 2944, wherein the conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

2947. The system of claim 2944, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2948. The system of claim 2944, wherein the conduit is further configurable to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

2949. The system of claim 2944, wherein the conduit is further configurable to remove an oxidation product.

2950. The system of claim 2944, wherein the conduit is further configurable to remove an oxidation product such that the oxidation product transfers heat to the oxidizing fluid.

2951. The system of claim 2944, wherein the conduit is further configurable to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

2952. The system of claim 2944, wherein the conduit is further configurable to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2953. The system of claim 2944, wherein the conduit is further configurable to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2954. The system of claim 2944, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2955. The system of claim 2944, further comprising a center conduit disposed within the conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configurable to remove an oxidation product during use.

2956. The system of claim 2944, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2957. The system of claim 2944, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2958. The system of claim 2944, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2959. The system of claim 2944, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2960. The system of claim 2944, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2961. The system of claim 2944, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2962. The system of claim 2944, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2963. The system of claim 2944, wherein the system is further configurable such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2964. A system configured to heat a coal formation, comprising:

a conductor disposed in a first conduit, wherein the first conduit is disposed in an opening in the formation, and wherein the conductor is configured to provide heat to at least a portion of the formation during use;

an oxidizing fluid source;

a second conduit disposed in the opening, wherein the second conduit is configured to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, and wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2965. The system of claim 2964, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2966. The system of claim 2964, wherein the second conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

2967. The system of claim 2964, wherein the second conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2968. The system of claim 2964, wherein the second conduit is further configured to be cooled with the oxidizing fluid to reduce heating of the second conduit by oxidation.

2969. The system of claim 2964, wherein the second conduit is further configured to remove an oxidation product.

2970. The system of claim 2964, wherein the second conduit is further configured to remove an oxidation product such that the oxidation product transfers heat to the oxidizing fluid.

2971. The system of claim 2964, wherein the second conduit is further configured to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the second conduit.

2972. The system of claim 2964, wherein the second conduit is further configured to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the second conduit and a pressure of the oxidation product in the second conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2973. The system of claim 2964, wherein the second conduit is further configured to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2974. The system of claim 2964, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2975. The system of claim 2964, further comprising a center conduit disposed within the second conduit, wherein the center conduit is configured to provide the oxidizing fluid into the opening during use, and wherein the second conduit is further configured to remove an oxidation product during use.

2976. The system of claim 2964, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2977. The system of claim 2964, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2978. The system of claim 2964, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2979. The system of claim 2964, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

2980. The system of claim 2964, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

2981. The system of claim 2964, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

2982. The system of claim 2964, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

2983. The system of claim 2964, wherein the system is further configured such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

2984. A system configurable to heat a coal formation, comprising:

a conductor configurable to be disposed in a first conduit, wherein the first conduit is configurable to be disposed in an opening in the formation, and wherein the conductor is further configurable to provide heat to at least a portion of the formation during use;

a second conduit configurable to be disposed in the opening, wherein the second conduit is further configurable to provide an oxidizing fluid from an oxidizing fluid source to a reaction zone in the formation during use, and wherein the system is configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

2985. The system of claim 2984, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

2986. The system of claim 2984, wherein the second conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

2987. The system of claim 2984, wherein the second conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

2988. The system of claim 2984, wherein the second conduit is further configurable to be cooled with the oxidizing fluid to reduce heating of the second conduit by oxidation.

2989. The system of claim 2984, wherein the second conduit is further configurable to remove an oxidation product.

2990. The system of claim 2984, wherein the second conduit is further configurable to remove an oxidation product such that the oxidation product transfers heat to the oxidizing fluid.

2991. The system of claim 2984, wherein the second conduit is further configurable to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the second conduit.

2992. The system of claim 2984, wherein the second conduit is further configurable to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the second conduit and a pressure of the oxidation product in the second conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

2993. The system of claim 2984, wherein the second conduit is further configurable to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2994. The system of claim 2984, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

2995. The system of claim 2984, further comprising a center conduit disposed within the second conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use, and wherein the second conduit is further configurable to remove an oxidation product during use.

2996. The system of claim 2984, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

2997. The system of claim 2984, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

2998. The system of claim 2984, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

2999. The system of claim 2984, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3000. The system of claim 2984, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3001. The system of claim 2984, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3002. The system of claim 2984, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3003. The system of claim 2984, wherein the system is further configurable such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

3004. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein heating comprises applying an electrical current to a conductor disposed in a first conduit

to provide heat to the portion, and wherein the first conduit is disposed within the opening;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

3005. The method of claim 3004, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

3006. The method of claim 3004, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a second conduit disposed in the opening.

3007. The method of claim 3004, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a second conduit disposed in the opening such that a rate of oxidation is controlled.

3008. The method of claim 3004, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

3009. The method of claim 3004, wherein a second conduit is disposed in the opening, the method further comprising cooling the second conduit with the oxidizing fluid to reduce heating of the second conduit by oxidation.

3010. The method of claim 3004, wherein a second conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the second conduit.

3011. The method of claim 3004, wherein a second conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the second conduit and transferring heat from the oxidation product in the conduit to the oxidizing fluid in the second conduit.

3012. The method of claim 3004, wherein a second conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the second conduit, wherein a flow rate of the oxidizing fluid in the second conduit is approximately equal to a flow rate of the oxidation product in the second conduit.

3013. The method of claim 3004, wherein a second conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the second conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the second conduit to reduce contamination of the oxidation product by the oxidizing fluid.

3014. The method of claim 3004, wherein a second conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

3015. The method of claim 3004, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

3016. The method of claim 3004, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

3017. The method of claim 3004, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3018. The method of claim 3004, further comprising removing water from the formation prior to heating the portion.

3019. The method of claim 3004, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

3020. The method of claim 3004, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3021. The method of claim 3004, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3022. The method of claim 3004, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3023. The method of claim 3004, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3024. A system configured to heat a coal formation, comprising:

an insulated conductor disposed in an opening in the formation, wherein the insulated conductor is configured to provide heat to at least a portion of the formation during use;

an oxidizing fluid source;

a conduit disposed in the opening, wherein the conduit is configured to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, and wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

3025. The system of claim 3024, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

3026. The system of claim 3024, wherein the conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

3027. The system of claim 3024, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

3028. The system of claim 3024, wherein the conduit is configured to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

3029. The system of claim 3024, wherein the conduit is further configured to remove an oxidation product.

3030. The system of claim 3024, wherein the conduit is further configured to remove an oxidation product, and wherein the conduit is further configured such that the oxidation product transfers substantial heat to the oxidizing fluid.

3031. The system of claim 3024, wherein the conduit is further configured to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3032. The system of claim 3024, wherein the conduit is further configured to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the second conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

3033. The system of claim 3024, wherein the conduit is further configured to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3034. The system of claim 3024, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3035. The system of claim 3024, further comprising a center conduit disposed within the conduit, wherein the center conduit is configured to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configured to remove an oxidation product during use.

3036. The system of claim 3024, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3037. The system of claim 3024, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3038. The system of claim 3024, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3039. The system of claim 3024, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3040. The system of claim 3024, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3041. The system of claim 3024, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3042. The system of claim 3024, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3043. The system of claim 3024, wherein the system is further configured such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

3044. A system configurable to heat a coal formation, comprising:

an insulated conductor configurable to be disposed in an opening in the formation, wherein the insulated conductor is further configurable to provide heat to at least a portion of the formation during use;

a conduit configurable to be disposed in the opening, wherein the conduit is further configurable to provide an oxidizing fluid from an oxidizing fluid source to a reaction zone in the formation during use, and wherein the system is configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

3045. The system of claim 3044, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

3046. The system of claim 3044, wherein the conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

3047. The system of claim 3044, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

3048. The system of claim 3044, wherein the conduit is further configurable to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

3049. The system of claim 3044, wherein the conduit is further configurable to remove an oxidation product.

3050. The system of claim 3044, wherein the conduit is further configurable to remove an oxidation product, such that the oxidation product transfers heat to the oxidizing fluid.

3051. The system of claim 3044, wherein the conduit is further configurable to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3052. The system of claim 3044, wherein the conduit is further configurable to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a

pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

3053. The system of claim 3044, wherein the conduit is further configurable to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3054. The system of claim 3044, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3055. The system of claim 3044, further comprising a center conduit disposed within the conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configurable to remove an oxidation product during use.

3056. The system of claim 3044, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3057. The system of claim 3044, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3058. The system of claim 3044, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3059. The system of claim 3044, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3060. The system of claim 3044, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3061. The system of claim 3044, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3062. The system of claim 3044, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3063. The system of claim 3044, wherein the system is further configurable such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

3064. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein heating comprises applying an electrical current to an insulated conductor to provide heat to the portion, and wherein the insulated conductor is disposed within the opening;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

3065. The method of claim 3064, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

3066. The method of claim 3064, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

3067. The method of claim 3064, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

3068. The method of claim 3064, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

3069. The method of claim 3064, wherein a conduit is disposed in the opening, the method further comprising cooling the conduit with the oxidizing fluid to reduce heating of the conduit by oxidation.

3070. The method of claim 3064, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit.

3071. The method of claim 3064, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and transferring heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

3072. The method of claim 3064, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3073. The method of claim 3064, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

3074. The method of claim 3064, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

3075. The method of claim 3064, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

3076. The method of claim 3064, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

3077. The method of claim 3064, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3078. The method of claim 3064, further comprising removing water from the formation prior to heating the portion.

3079. The method of claim 3064, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

3080. The method of claim 3064, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3081. The method of claim 3064, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3082. The method of claim 3064, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3083. The method of claim 3064, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3084. The method of claim 3064, wherein the pyrolysis zone is substantially adjacent to the reaction zone.

3085. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein the portion is located substantially adjacent to an opening in the formation, wherein heating comprises applying an electrical current to an insulated conductor to provide heat to the portion, wherein the insulated conductor is coupled to a conduit, wherein the conduit comprises critical flow orifices, and wherein the conduit is disposed within the opening;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

3086. The method of claim 3085, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

3087. The method of claim 3085, further comprising controlling a flow of the oxidizing fluid with the critical flow orifices such that a rate of oxidation is controlled.

3088. The method of claim 3085, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

3089. The method of claim 3085, further comprising cooling the conduit with the oxidizing fluid to reduce heating of the conduit by oxidation.

3090. The method of claim 3085, further comprising removing an oxidation product from the formation through the conduit.

3091. The method of claim 3085, further comprising removing an oxidation product from the formation through the conduit and transferring heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

3092. The method of claim 3085, further comprising removing an oxidation product from the formation through the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3093. The method of claim 3085, further comprising removing an oxidation product from the formation through the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

3094. The method of claim 3085, further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

3095. The method of claim 3085, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

3096. The method of claim 3085, wherein a center conduit is disposed within the conduit, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the conduit.

3097. The method of claim 3085, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3098. The method of claim 3085, further comprising removing water from the formation prior to heating the portion.

3099. The method of claim 3085, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

3100. The method of claim 3085, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3101. The method of claim 3085, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3102. The method of claim 3085, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3103. The method of claim 3085, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3104. The method of claim 3085, wherein the pyrolysis zone is substantially adjacent to the reaction zone.

3105. A system configured to heat a coal formation, comprising:

at least one elongated member disposed in an opening in the formation, wherein at least the one elongated member is configured to provide heat to at least a portion of the formation during use;

an oxidizing fluid source;

a conduit disposed in the opening, wherein the conduit is configured to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, and wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

3106. The system of claim 3105, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

3107. The system of claim 3105, wherein the conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

3108. The system of claim 3105, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

3109. The system of claim 3105, wherein the conduit is further configured to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

3110. The system of claim 3105, wherein the conduit is further configured to remove an oxidation product.

3111. The system of claim 3105, wherein the conduit is further configured to remove an oxidation product such that the oxidation product transfers heat to the oxidizing fluid.

3112. The system of claim 3105, wherein the conduit is further configured to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3113. The system of claim 3105, wherein the conduit is further configured to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

3114. The system of claim 3105, wherein the conduit is further configured to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3115. The system of claim 3105, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3116. The system of claim 3105, further comprising a center conduit disposed within the conduit, wherein the center conduit is configured to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configured to remove an oxidation product during use.

3117. The system of claim 3105, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3118. The system of claim 3105, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3119. The system of claim 3105, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3120. The system of claim 3105, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3121. The system of claim 3105, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3122. The system of claim 3105, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3123. The system of claim 3105, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3124. The system of claim 3105, wherein the system is further configured such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

3125. A system configurable to heat a coal formation, comprising:

at least one elongated member configurable to be disposed in an opening in the formation, wherein at least the one elongated member is further configurable to provide heat to at least a portion of the formation during use;

a conduit configurable to be disposed in the opening, wherein the conduit is further configurable to provide an oxidizing fluid from the oxidizing fluid source to a reaction zone in the formation during use, and wherein the system is configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at the reaction zone during use such that heat is generated at the reaction zone; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

3126. The system of claim 3125, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

3127. The system of claim 3125, wherein the conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

3128. The system of claim 3125, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

3129. The system of claim 3125, wherein the conduit is further configurable to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

3130. The system of claim 3125, wherein the conduit is further configurable to remove an oxidation product.

3131. The system of claim 3125, wherein the conduit is further configurable to remove an oxidation product such that the oxidation product transfers heat to the oxidizing fluid.

3132. The system of claim 3125, wherein the conduit is further configurable to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3133. The system of claim 3125, wherein the conduit is further configurable to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

3134. The system of claim 3125, wherein the conduit is further configurable to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3135. The system of claim 3125, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3136. The system of claim 3125, further comprising a center conduit disposed within the conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configurable to remove an oxidation product during use.

3137. The system of claim 3125, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3138. The system of claim 3125, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3139. The system of claim 3125, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3140. The system of claim 3125, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3141. The system of claim 3125, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3142. The system of claim 3125, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3143. The system of claim 3125, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3144. The system of claim 3125, wherein the system is further configurable such that transferred heat can pyrolyze at least some hydrocarbons in the pyrolysis zone.

3145. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein heating comprises applying an electrical current to at least one elongated member to

provide heat to the portion, and wherein at least the one elongated member is disposed within the opening;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

3146. The method of claim 3145, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

3147. The method of claim 3145, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

3148. The method of claim 3145, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

3149. The method of claim 3145, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

3150. The method of claim 3145, wherein a conduit is disposed in the opening, the method further comprising cooling the conduit with the oxidizing fluid to reduce heating of the conduit by oxidation.

3151. The method of claim 3145, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit.

3152. The method of claim 3145, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and transferring heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

3153. The method of claim 3145, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3154. The method of claim 3145, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

3155. The method of claim 3145, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

3156. The method of claim 3145, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

3157. The method of claim 3145, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

3158. The method of claim 3145, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3159. The method of claim 3145, further comprising removing water from the formation prior to heating the portion.

3160. The method of claim 3145, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

3161. The method of claim 3145, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3162. The method of claim 3145, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3163. The method of claim 3145, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3164. The method of claim 3145, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3165. The method of claim 3145, wherein the pyrolysis zone is substantially adjacent to the reaction zone.

3166. A system configured to heat a coal formation, comprising:

a heat exchanger disposed external to the formation, wherein the heat exchanger is configured to heat an oxidizing fluid during use;

a conduit disposed in the opening, wherein the conduit is configured to provide the heated oxidizing fluid from the heat exchanger to at least a portion of the formation

during use, wherein the system is configured to allow heat to transfer from the heated oxidizing fluid to at least the portion of the formation during use, and wherein the oxidizing fluid is selected to oxidize at least some hydrocarbons at a reaction zone in the formation during use such that heat is generated at the reaction zone; and

wherein the system is configured to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

3167. The system of claim 3166, wherein the oxidizing fluid is configured to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

3168. The system of claim 3166, wherein the conduit comprises orifices, and wherein the orifices are configured to provide the oxidizing fluid into the opening.

3169. The system of claim 3166, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configured to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

3170. The system of claim 3166, wherein the conduit is further configured to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

3171. The system of claim 3166, wherein the conduit is further configured to remove an oxidation product.

3172. The system of claim 3166, wherein the conduit is further configured to remove an oxidation product, such that the oxidation product transfers heat to the oxidizing fluid.

3173. The system of claim 3166, wherein the conduit is further configured to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3174. The system of claim 3166, wherein the conduit is further configured to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

3175. The system of claim 3166, wherein the conduit is further configured to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3176. The system of claim 3166, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3177. The system of claim 3166, further comprising a center conduit disposed within the conduit, wherein the center conduit is configured to provide the oxidizing fluid into the opening during use, and wherein the conduit is further configured to remove an oxidation product during use.

3178. The system of claim 3166, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3179. The system of claim 3166, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3180. The system of claim 3166, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3181. The system of claim 3166, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3182. The system of claim 3166, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3183. The system of claim 3166, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3184. The system of claim 3166, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3185. A system configurable to heat a coal formation, comprising:

a heat exchanger configurable to be disposed external to the formation, wherein the heat exchanger is further configurable to heat an oxidizing fluid during use;

a conduit configurable to be disposed in the opening, wherein the conduit is further configurable to provide the heated oxidizing fluid from the heat exchanger to at least a portion of the formation during use, wherein the system is configurable to allow heat to transfer from the heated oxidizing fluid to at least the portion of the formation during use, and wherein the system is further configurable to allow the oxidizing fluid to oxidize at least some hydrocarbons at a reaction zone in the formation during use such that heat is generated at the reaction zone; and

wherein the system is further configurable to allow heat to transfer substantially by conduction from the reaction zone to a pyrolysis zone of the formation during use.

3186. The system of claim 3185, wherein the oxidizing fluid is configurable to generate heat in the reaction zone such that the oxidizing fluid is transported through the reaction zone substantially by diffusion.

3187. The system of claim 3185, wherein the conduit comprises orifices, and wherein the orifices are configurable to provide the oxidizing fluid into the opening.

3188. The system of claim 3185, wherein the conduit comprises critical flow orifices, and wherein the critical flow orifices are configurable to control a flow of the oxidizing fluid such that a rate of oxidation in the formation is controlled.

3189. The system of claim 3185, wherein the conduit is further configurable to be cooled with the oxidizing fluid such that the conduit is not substantially heated by oxidation.

3190. The system of claim 3185, wherein the conduit is further configurable to remove an oxidation product.

3191. The system of claim 3185, wherein the conduit is further configurable to remove an oxidation product such that the oxidation product transfers heat to the oxidizing fluid.

3192. The system of claim 3185, wherein the conduit is further configurable to remove an oxidation product, and wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3193. The system of claim 3185, wherein the conduit is further configurable to remove an oxidation product, and wherein a pressure of the oxidizing fluid in the conduit and a pressure of the oxidation product in the conduit are controlled to reduce contamination of the oxidation product by the oxidizing fluid.

3194. The system of claim 3185, wherein the conduit is further configurable to remove an oxidation product, and wherein the oxidation product is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3195. The system of claim 3185, wherein the oxidizing fluid is substantially inhibited from flowing into portions of the formation beyond the reaction zone.

3196. The system of claim 3185, further comprising a center conduit disposed within the conduit, wherein center conduit is configurable to provide the oxidizing fluid into the opening during use, and wherein the second conduit is further configurable to remove an oxidation product during use.

3197. The system of claim 3185, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3198. The system of claim 3185, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3199. The system of claim 3185, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3200. The system of claim 3185, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3201. The system of claim 3185, further comprising an overburden casing coupled to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3202. The system of claim 3185, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3203. The system of claim 3185, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

NDC (HEAT EXCHANGER PREHEATING METHOD)

3204. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein heating comprises:

heating the oxidizing fluid with a heat exchanger, wherein the heat exchanger is disposed external to the formation;

providing the heated oxidizing fluid from the heat exchanger to the portion of the formation; and

allowing heat to transfer from the heated oxidizing fluid to the portion of the formation;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

3205. The method of claim 3204, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

3206. The method of claim 3204, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

3207. The method of claim 3204, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

3208. The method of claim 3204, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

3209. The method of claim 3204, wherein a conduit is disposed in the opening, the method further comprising cooling the conduit with the oxidizing fluid to reduce heating of the conduit by oxidation.

3210. The method of claim 3204, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit.

3211. The method of claim 3204, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and transferring heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

3212. The method of claim 3204, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3213. The method of claim 3204, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through

the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

3214. The method of claim 3204, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

3215. The method of claim 3204, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

3216. The method of claim 3204, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

3217. The method of claim 3204, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3218. The method of claim 3204, further comprising removing water from the formation prior to heating the portion.

3219. The method of claim 3204, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

3220. The method of claim 3204, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3221. The method of claim 3204, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3222. The method of claim 3204, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3223. The method of claim 3204, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3224. The method of claim 3204, wherein the pyrolysis zone is substantially adjacent to the reaction zone.

3225. An in situ method for heating a coal formation, comprising:

heating a portion of the formation to a temperature sufficient to support reaction of hydrocarbons within the portion of the formation with an oxidizing fluid, wherein heating comprises:

oxidizing a fuel gas in a heater, wherein the heater is disposed external to the formation;

providing the oxidized fuel gas from the heater to the portion of the formation; and

allowing heat to transfer from the oxidized fuel gas to the portion of the formation;

providing the oxidizing fluid to a reaction zone in the formation;

allowing the oxidizing fluid to react with at least a portion of the hydrocarbons at the reaction zone to generate heat at the reaction zone; and

transferring the generated heat substantially by conduction from the reaction zone to a pyrolysis zone in the formation.

3226. The method of claim 3225, further comprising transporting the oxidizing fluid through the reaction zone by diffusion.

3227. The method of claim 3225, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

3228. The method of claim 3225, further comprising controlling a flow of the oxidizing fluid with critical flow orifices of a conduit disposed in the opening such that a rate of oxidation is controlled.

3229. The method of claim 3225, further comprising increasing a flow of the oxidizing fluid in the opening to accommodate an increase in a volume of the reaction zone such that a rate of oxidation is substantially constant over time within the reaction zone.

3230. The method of claim 3225, wherein a conduit is disposed in the opening, the method further comprising cooling the conduit with the oxidizing fluid to reduce heating of the conduit by oxidation.

3231. The method of claim 3225, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit.

3232. The method of claim 3225, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and transferring heat from the oxidation product in the conduit to the oxidizing fluid in the conduit.

3233. The method of claim 3225, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit, wherein a flow rate of the oxidizing fluid in the conduit is approximately equal to a flow rate of the oxidation product in the conduit.

3234. The method of claim 3225, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

3235. The method of claim 3225, wherein a conduit is disposed within the opening, the method further comprising removing an oxidation product from the formation through the conduit and substantially inhibiting the oxidation product from flowing into portions of the formation beyond the reaction zone.

3236. The method of claim 3225, further comprising substantially inhibiting the oxidizing fluid from flowing into portions of the formation beyond the reaction zone.

3237. The method of claim 3225, wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method further comprising providing the oxidizing fluid into the opening through the center conduit and removing an oxidation product through the outer conduit.

3238. The method of claim 3225, wherein the portion of the formation extends radially from the opening a width of less than approximately 0.2 m.

3239. The method of claim 3225, further comprising removing water from the formation prior to heating the portion.

3240. The method of claim 3225, further comprising controlling the temperature of the formation to substantially inhibit production of oxides of nitrogen during oxidation.

3241. The method of claim 3225, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3242. The method of claim 3225, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3243. The method of claim 3225, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3244. The method of claim 3225, further comprising coupling an overburden casing to the opening, wherein a packing material is disposed at a junction of the overburden casing and the opening.

3245. The method of claim 3225, wherein the pyrolysis zone is substantially adjacent to the reaction zone.

3246. A system configured to heat a coal formation, comprising:

an insulated conductor disposed within an open wellbore in the formation, wherein the insulated conductor is configured to provide radiant heat to at least a portion of the formation during use; and

wherein the system is configured to allow heat to transfer from the insulated conductor to a selected section of the formation during use.

3247. The system of claim 3246, wherein the insulated conductor is further configured to generate heat during application of an electrical current to the insulated conductor during use.

3248. The system of claim 3246, further comprising a support member, wherein the support member is configured to support the insulated conductor.

3249. The system of claim 3246, further comprising a support member and a centralizer, wherein the support member is configured to support the insulated conductor, and wherein the centralizer is configured to maintain a location of the insulated conductor on the support member.

3250. The system of claim 3246, wherein the open wellbore comprises a diameter of at least approximately 5 cm.

3251. The system of claim 3246, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configured to generate substantially no heat.

3252. The system of claim 3246, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a rubber insulated conductor.

3253. The system of claim 3246, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a copper wire.

3254. The system of claim 3246, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor.

3255. The system of claim 3246, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3256. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath.

3257. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the conductor comprises a copper-nickel alloy.

3258. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight.

3259. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 2 % nickel by weight to approximately 6 % nickel by weight.

3260. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises a thermally conductive material.

3261. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3262. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3263. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3264. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configured to occupy porous spaces within the magnesium oxide.

3265. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3266. The system of claim 3246, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3267. The system of claim 3246, further comprising two additional insulated conductors, wherein the insulated conductor and the two additional insulated conductors are configured in a 3-phase Y configuration.

3268. The system of claim 3246, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configured in a series electrical configuration.

3269. The system of claim 3246, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configured in a parallel electrical configuration.

3270. The system of claim 3246, wherein the insulated conductor is configured to generate radiant heat of approximately 500 W/m to approximately 1150 W/m during use.

3271. The system of claim 3246, further comprising a support member configured to support the insulated conductor, wherein the support member comprises orifices configured to provide fluid flow through the support member into the open wellbore during use.

3272. The system of claim 3246, further comprising a support member configured to support the insulated conductor, wherein the support member comprises critical flow orifices configured to provide a substantially constant amount of fluid flow through the support member into the open wellbore during use.

3273. The system of claim 3246, further comprising a tube coupled to the insulated conductor, wherein the tube is configured to provide a flow of fluid into the open wellbore during use.

3274. The system of claim 3246, further comprising a tube coupled to the insulated conductor, wherein the tube comprises critical flow orifices configured to provide a substantially constant amount of fluid flow through the support member into the open wellbore during use.

3275. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation.

3276. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3277. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3278. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the open wellbore.

3279. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the open wellbore, and wherein the packing material is configured to substantially inhibit a flow of fluid between the open wellbore and the overburden casing during use.

3280. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the open wellbore, and wherein the packing material comprises cement.

3281. The system of claim 3246, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, the system further comprising a wellhead coupled to the overburden casing and a lead-in conductor coupled to the insulated conductor, wherein the wellhead is disposed external to the overburden, wherein the wellhead comprises at least one sealing flange, and wherein at least the one sealing flange is configured to couple to the lead-in conductor.

3282. The system of claim 3246, wherein the system is further configured to transfer heat such that the transferred heat can pyrolyze at least some of the hydrocarbons in the selected section.

3283. A system configurable to heat a coal formation, comprising:

an insulated conductor configurable to be disposed within an open wellbore in the formation, wherein the insulated conductor is further configurable to provide radiant heat to at least a portion of the formation during use; and

wherein the system is configurable to allow heat to transfer from the insulated conductor to a selected section of the formation during use.

3284. The system of claim 3283, wherein the insulated conductor is further configurable to generate heat during application of an electrical current to the insulated conductor during use.

3285. The system of claim 3283, further comprising a support member, wherein the support member is configurable to support the insulated conductor.

3286. The system of claim 3283, further comprising a support member and a centralizer, wherein the support member is configurable to support the insulated conductor, and wherein the centralizer is configurable to maintain a location of the insulated conductor on the support member.

3287. The system of claim 3283, wherein the open wellbore comprises a diameter of at least approximately 5 cm.

3288. The system of claim 3283, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configurable to generate substantially no heat.

3289. The system of claim 3283, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a rubber insulated conductor.

3290. The system of claim 3283, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a copper wire.

3291. The system of claim 3283, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor.

3292. The system of claim 3283, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3293. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath.

3294. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the conductor comprises a copper-nickel alloy.

3295. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight.

3296. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 2 % nickel by weight to approximately 6 % nickel by weight.

3297. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises a thermally conductive material.

3298. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3299. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3300. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3301. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configurable to occupy porous spaces within the magnesium oxide.

3302. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3303. The system of claim 3283, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3304. The system of claim 3283, further comprising two additional insulated conductors, wherein the insulated conductor and the two additional insulated conductors are configurable in a 3-phase Y configuration.

3305. The system of claim 3283, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configurable in a series electrical configuration.

3306. The system of claim 3283, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configurable in a parallel electrical configuration.

3307. The system of claim 3283, wherein the insulated conductor is configurable to generate radiant heat of approximately 500 W/m to approximately 1150 W/m during use.

3308. The system of claim 3283, further comprising a support member configurable to support the insulated conductor, wherein the support member comprises orifices configurable to provide fluid flow through the support member into the open wellbore during use.

3309. The system of claim 3283, further comprising a support member configurable to support the insulated conductor, wherein the support member comprises critical flow orifices configurable to provide a substantially constant amount of fluid flow through the support member into the open wellbore during use.

3310. The system of claim 3283, further comprising a tube coupled to the insulated conductor, wherein the tube is configurable to provide a flow of fluid into the open wellbore during use.

3311. The system of claim 3283, further comprising a tube coupled to the first insulated conductor, wherein the tube comprises critical flow orifices configurable to provide a

substantially constant amount of fluid flow through the support member into the open wellbore during use.

3312. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation.

3313. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3314. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3315. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the open wellbore.

3316. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the open wellbore, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the open wellbore and the overburden casing during use.

3317. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the open wellbore, and wherein the packing material comprises cement.

3318. The system of claim 3283, further comprising an overburden casing coupled to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, the system further comprising a wellhead coupled to the overburden casing and a lead-in conductor coupled to the insulated conductor, wherein the wellhead is disposed external to the overburden, wherein the wellhead comprises at least one sealing flange, and wherein at least the one sealing flange is configurable to couple to the lead-in conductor.

3319. The system of claim 3283, wherein the system is further configured to transfer heat such that the transferred heat can pyrolyze at least some hydrocarbons in the selected section.

3320. An in situ method for heating a coal formation, comprising:

applying an electrical current to an insulated conductor to provide radiant heat to at least a portion of the formation, wherein the insulated conductor is disposed within an open wellbore in the formation; and

allowing the radiant heat to transfer from the insulated conductor to a selected section of the formation.

3321. The method of claim 3320, further comprising supporting the insulated conductor on a support member.

3322. The method of claim 3320, further comprising supporting the insulated conductor on a support member and maintaining a location of the insulated conductor on the support member with a centralizer.

3323. The method of claim 3320, wherein the insulated conductor is coupled to two additional insulated conductors, wherein the insulated conductor and the two insulated conductors are disposed within the open wellbore, and wherein the three insulated conductors are electrically coupled in a 3-phase Y configuration.

3324. The method of claim 3320, wherein an additional insulated conductor is disposed within the open wellbore.

3325. The method of claim 3320, wherein an additional insulated conductor is disposed within the open wellbore, and wherein the insulated conductor and the additional insulated conductor are electrically coupled in a series configuration.

3326. The method of claim 3320, wherein an additional insulated conductor is disposed within the open wellbore, and wherein the insulated conductor and the additional insulated conductor are electrically coupled in a parallel configuration.

3327. The method of claim 3320, wherein the provided heat comprises approximately 500 W/m to approximately 1150 W/m.

3328. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the conductor comprises a copper-nickel alloy.

3329. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight.

3330. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 2 % nickel by weight to approximately 6 % nickel by weight.

3331. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3332. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3333. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3334. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configured to occupy porous spaces within the magnesium oxide.

3335. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3336. The method of claim 3320, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3337. The method of claim 3320, further comprising supporting the insulated conductor on a support member and flowing a fluid into the open wellbore through an orifice in the support member.

3338. The method of claim 3320, further comprising supporting the insulated conductor on a support member and flowing a substantially constant amount of fluid into the open wellbore through critical flow orifices in the support member.

3339. The method of claim 3320, wherein a perforated tube is disposed in the open wellbore proximate to the insulated conductor, the method further comprising flowing a fluid into the open wellbore through the perforated tube.

3340. The method of claim 3320, wherein a tube is disposed in the open wellbore proximate to the insulated conductor, the method further comprising flowing a substantially constant amount a fluid into the open wellbore through critical flow orifices in the tube.

3341. The method of claim 3320, further comprising supporting the insulated conductor on a support member and flowing a corrosion inhibiting fluid into the open wellbore through an orifice in the support member.

3342. The method of claim 3320, wherein a perforated tube is disposed in the open wellbore proximate to the insulated conductor, the method further comprising flowing a corrosion inhibiting fluid into the open wellbore through the perforated tube.

3343. The method of claim 3320, further comprising determining a temperature distribution in the insulated conductor using an electromagnetic signal provided to the insulated conductor.

3344. The method of claim 3320, further comprising monitoring a leakage current of the insulated conductor.

3345. The method of claim 3320, further comprising monitoring the applied electrical current.

3346. The method of claim 3320, further comprising monitoring a voltage applied to the insulated conductor.

3347. The method of claim 3320, further comprising monitoring a temperature in the insulated conductor with at least one thermocouple.

3348. The method of claim 3320, further comprising electrically coupling a lead-in conductor to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configured to generate substantially no heat.

3349. The method of claim 3320, further comprising electrically coupling a lead-in conductor to the insulated conductor using a cold pin transition conductor.

3350. The method of claim 3320, further comprising electrically coupling a lead-in conductor to the insulated conductor using a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3351. The method of claim 3320, further comprising coupling an overburden casing to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation.

3352. The method of claim 3320, further comprising coupling an overburden casing to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3353. The method of claim 3320, further comprising coupling an overburden casing to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3354. The method of claim 3320, further comprising coupling an overburden casing to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the open wellbore.

3355. The method of claim 3320, further comprising coupling an overburden casing to the open wellbore, wherein the overburden casing is disposed in an overburden of the formation, and wherein the method further comprises inhibiting a flow of fluid between the open wellbore and the overburden casing with a packing material.

3356. The method of claim 3320, further comprising heating at least the portion of the formation to pyrolyze at least some hydrocarbons within the formation.

3357. An in situ method for heating a coal formation, comprising:

applying an electrical current to an insulated conductor to provide heat to at least a portion of the formation, wherein the insulated conductor is disposed within an opening in the formation; and

allowing the heat to transfer from the insulated conductor to a section of the formation.

3358. The method of claim 3357, further comprising supporting the insulated conductor on a support member.

3359. The method of claim 3357, further comprising supporting the insulated conductor on a support member and maintaining a location of the first insulated conductor on the support member with a centralizer.

3360. The method of claim 3357, wherein the insulated conductor is coupled to two additional insulated conductors, wherein the insulated conductor and the two insulated conductors are disposed within the opening, and wherein the three insulated conductors are electrically coupled in a 3-phase Y configuration.

3361. The method of claim 3357, wherein an additional insulated conductor is disposed within the opening.

3362. The method of claim 3357, wherein an additional insulated conductor is disposed within the opening, and wherein the insulated conductor and the additional insulated conductor are electrically coupled in a series configuration.

3363. The method of claim 3357, wherein an additional insulated conductor is disposed within the opening, and wherein the insulated conductor and the additional insulated conductor are electrically coupled in a parallel configuration.

3364. The method of claim 3357, wherein the provided heat comprises approximately 500 W/m to approximately 1150 W/m.

3365. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the conductor comprises a copper-nickel alloy.

3366. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight.

3367. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 2 % nickel by weight to approximately 6 % nickel by weight.

3368. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3369. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically

insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3370. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3371. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configured to occupy porous spaces within the magnesium oxide.

3372. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3373. The method of claim 3357, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3374. The method of claim 3357, further comprising supporting the insulated conductor on a support member and flowing a fluid into the opening through an orifice in the support member.

3375. The method of claim 3357, further comprising supporting the insulated conductor on a support member and flowing a substantially constant amount of fluid into the opening through critical flow orifices in the support member.

3376. The method of claim 3357, wherein a perforated tube is disposed in the opening proximate to the insulated conductor, the method further comprising flowing a fluid into the opening through the perforated tube.

3377. The method of claim 3357, wherein a tube is disposed in the opening proximate to the insulated conductor, the method further comprising flowing a substantially constant amount a fluid into the opening through critical flow orifices in the tube.

3378. The method of claim 3357, further comprising supporting the insulated conductor on a support member and flowing a corrosion inhibiting fluid into the opening through an orifice in the support member.

3379. The method of claim 3357, wherein a perforated tube is disposed in the opening proximate to the insulated conductor, the method further comprising flowing a corrosion inhibiting fluid into the opening through the perforated tube.

3380. The method of claim 3357, further comprising determining a temperature distribution in the insulated conductor using an electromagnetic signal provided to the insulated conductor.

3381. The method of claim 3357, further comprising monitoring a leakage current of the insulated conductor.

3382. The method of claim 3357, further comprising monitoring the applied electrical current.

3383. The method of claim 3357, further comprising monitoring a voltage applied to the insulated conductor.

3384. The method of claim 3357, further comprising monitoring a temperature in the insulated conductor with at least one thermocouple.

3385. The method of claim 3357, further comprising electrically coupling a lead-in conductor to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configured to generate substantially no heat.

3386. The method of claim 3357, further comprising electrically coupling a lead-in conductor to the insulated conductor using a cold pin transition conductor.

3387. The method of claim 3357, further comprising electrically coupling a lead-in conductor to the insulated conductor using a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3388. The method of claim 3357, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3389. The method of claim 3357, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3390. The method of claim 3357, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3391. The method of claim 3357, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the opening.

3392. The method of claim 3357, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the method further comprises inhibiting a flow of fluid between the opening and the overburden casing with a packing material.

3393. The method of claim 3357, further comprising heating at least the portion of the formation to substantially pyrolyze at least some hydrocarbons within the formation.

3394. A system configured to heat a coal formation, comprising:

an insulated conductor disposed within an opening in the formation, wherein the insulated conductor is configured to provide heat to at least a portion of the formation during use, wherein the insulated conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight; and

wherein the system is configured to allow heat to transfer from the insulated conductor to a selected section of the formation during use.

3395. The system of claim 3394, wherein the insulated conductor is further configured to generate heat during application of an electrical current to the insulated conductor during use.

3396. The system of claim 3394, further comprising a support member, wherein the support member is configured to support the insulated conductor.

3397. The system of claim 3394, further comprising a support member and a centralizer, wherein the support member is configured to support the insulated conductor, and wherein the centralizer is configured to maintain a location of the insulated conductor on the support member.

3398. The system of claim 3394, wherein the opening comprises a diameter of at least approximately 5 cm.

3399. The system of claim 3394, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configured to generate substantially no heat.

3400. The system of claim 3394, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a rubber insulated conductor.

3401. The system of claim 3394, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a copper wire.

3402. The system of claim 3394, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor.

3403. The system of claim 3394, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3404. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises a thermally conductive material.

3405. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3406. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3407. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3408. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configured to occupy porous spaces within the magnesium oxide.

3409. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3410. The system of claim 3394, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3411. The system of claim 3394, further comprising two additional insulated conductors, wherein the insulated conductor and the two additional insulated conductors are configured in a 3-phase Y configuration.

3412. The system of claim 3394, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configured in a series electrical configuration.

3413. The system of claim 3394, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configured in a parallel electrical configuration.

3414. The system of claim 3394, wherein the insulated conductor is configured to generate radiant heat of approximately 500 W/m to approximately 1150 W/m during use.

3415. The system of claim 3394, further comprising a support member configured to support the insulated conductor, wherein the support member comprises orifices configured to provide fluid flow through the support member into the opening during use.

3416. The system of claim 3394, further comprising a support member configured to support the insulated conductor, wherein the support member comprises critical flow orifices configured to provide a substantially constant amount of fluid flow through the support member into the opening during use.

3417. The system of claim 3394, further comprising a tube coupled to the insulated conductor, wherein the tube is configured to provide a flow of fluid into the opening during use.

3418. The system of claim 3394, further comprising a tube coupled to the insulated conductor, wherein the tube comprises critical flow orifices configured to provide a substantially constant amount of fluid flow through the support member into the opening during use.

3419. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3420. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3421. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3422. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the opening.

3423. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configured to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3424. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3425. The system of claim 3394, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, the system further comprising a wellhead coupled to the overburden casing and a lead-in conductor coupled to the insulated conductor, wherein the wellhead is disposed external to the overburden, wherein the wellhead comprises at least one sealing flange, and wherein at least the one sealing flange is configured to couple to the lead-in conductor.

3426. The system of claim 3394, wherein the system is further configured to transfer heat such that the transferred heat can pyrolyze at least some hydrocarbons in the selected section.

3427. A system configurable to heat a coal formation, comprising:

an insulated conductor configurable to be disposed within an opening in the formation, wherein the insulated conductor is further configurable to provide heat to at least a portion of the formation during use, wherein the insulated conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight;

wherein the system is configurable to allow heat to transfer from the insulated conductor to a selected section of the formation during use.

3428. The system of claim 3427, wherein the insulated conductor is further configurable to generate heat during application of an electrical current to the insulated conductor during use.

3429. The system of claim 3427, further comprising a support member, wherein the support member is configurable to support the insulated conductor.

3430. The system of claim 3427, further comprising a support member and a centralizer, wherein the support member is configurable to support the insulated conductor, and wherein the centralizer is configurable to maintain a location of the insulated conductor on the support member.

3431. The system of claim 3427, wherein the opening comprises a diameter of at least approximately 5 cm.

3432. The system of claim 3427, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configurable to generate substantially no heat.

3433. The system of claim 3427, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a rubber insulated conductor.

3434. The system of claim 3427, further comprising a lead-in conductor coupled to the insulated conductor, wherein the lead-in conductor comprises a copper wire.

3435. The system of claim 3427, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor.

3436. The system of claim 3427, further comprising a lead-in conductor coupled to the insulated conductor with a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3437. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises a thermally conductive material.

3438. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3439. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3440. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3441. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configurable to occupy porous spaces within the magnesium oxide.

3442. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3443. The system of claim 3427, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3444. The system of claim 3427, further comprising two additional insulated conductors, wherein the insulated conductor and the two additional insulated conductors are configurable in a 3-phase Y configuration.

3445. The system of claim 3427, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configurable in a series electrical configuration.

3446. The system of claim 3427, further comprising an additional insulated conductor, wherein the insulated conductor and the additional insulated conductor are coupled to a support member, and wherein the insulated conductor and the additional insulated conductor are configurable in a parallel electrical configuration.

3447. The system of claim 3427, wherein the insulated conductor is configurable to generate radiant heat of approximately 500 W/m to approximately 1150 W/m during use.

3448. The system of claim 3427, further comprising a support member configurable to support the insulated conductor, wherein the support member comprises orifices configurable to provide fluid flow through the support member into the open wellbore during use.

3449. The system of claim 3427, further comprising a support member configurable to support the insulated conductor, wherein the support member comprises critical flow orifices configurable to provide a substantially constant amount of fluid flow through the support member into the opening during use.

3450. The system of claim 3427, further comprising a tube coupled to the insulated conductor, wherein the tube is configurable to provide a flow of fluid into the opening during use.

3451. The system of claim 3427, further comprising a tube coupled to the insulated conductor, wherein the tube comprises critical flow orifices configurable to provide a substantially constant amount of fluid flow through the support member into the opening during use.

3452. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3453. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3454. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3455. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the opening.

3456. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material is configurable to substantially inhibit a flow of fluid between the opening and the overburden casing during use.

3457. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, wherein a packing material is disposed at a junction of the overburden casing and the opening, and wherein the packing material comprises cement.

3458. The system of claim 3427, further comprising an overburden casing coupled to the opening, wherein the overburden casing is disposed in an overburden of the formation, the system further comprising a wellhead coupled to the overburden casing and a lead-in conductor coupled to the insulated conductor, wherein the wellhead is disposed external to the overburden, wherein the wellhead comprises at least one sealing flange, and wherein at least the one sealing flange is configurable to couple to the lead-in conductor.

3459. The system of claim 3427, wherein the system is further configured to transfer heat such that the transferred heat can pyrolyze at least some hydrocarbons in the selected section.

3460. An in situ method for heating a coal formation, comprising:

applying an electrical current to an insulated conductor to provide heat to at least a portion of the formation, wherein the insulated conductor is disposed within an opening

in the formation, and wherein the insulated conductor comprises a copper-nickel alloy of approximately 7 % nickel by weight to approximately 12 % nickel by weight; and

allowing the heat to transfer from the insulated conductor to a selected section of the formation.

3461. The method of claim 3460, further comprising supporting the insulated conductor on a support member.

3462. The method of claim 3460, further comprising supporting the insulated conductor on a support member and maintaining a location of the first insulated conductor on the support member with a centralizer.

3463. The method of claim 3460, wherein the insulated conductor is coupled to two additional insulated conductors, wherein the insulated conductor and the two insulated conductors are disposed within the opening, and wherein the three insulated conductors are electrically coupled in a 3-phase Y configuration.

3464. The method of claim 3460, wherein an additional insulated conductor is disposed within the opening.

3465. The method of claim 3460, wherein an additional insulated conductor is disposed within the opening, and wherein the insulated conductor and the additional insulated conductor are electrically coupled in a series configuration.

3466. The method of claim 3460, wherein an additional insulated conductor is disposed within the opening, and wherein the insulated conductor and the additional insulated conductor are electrically coupled in a parallel configuration.

3467. The method of claim 3460, wherein the provided heat comprises approximately 500 W/m to approximately 1150 W/m.

3468. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material.

3469. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3470. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3471. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3472. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configured to occupy porous spaces within the magnesium oxide.

3473. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3474. The method of claim 3460, wherein the copper-nickel alloy is disposed in an electrically insulating material, wherein the insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3475. The method of claim 3460, further comprising supporting the insulated conductor on a support member and flowing a fluid into the opening through an orifice in the support member.

3476. The method of claim 3460, further comprising supporting the insulated conductor on a support member and flowing a substantially constant amount of fluid into the opening through critical flow orifices in the support member.

3477. The method of claim 3460, wherein a perforated tube is disposed in the opening proximate to the insulated conductor, the method further comprising flowing a fluid into the opening through the perforated tube.

3478. The method of claim 3460, wherein a tube is disposed in the opening proximate to the insulated conductor, the method further comprising flowing a substantially constant amount a fluid into the opening through critical flow orifices in the tube.

3479. The method of claim 3460, further comprising supporting the insulated conductor on a support member and flowing a corrosion inhibiting fluid into the opening through an orifice in the support member.

3480. The method of claim 3460, wherein a perforated tube is disposed in the opening proximate to the insulated conductor, the method further comprising flowing a corrosion inhibiting fluid into the opening through the perforated tube.

3481. The method of claim 3460, further comprising determining a temperature distribution in the insulated conductor using an electromagnetic signal provided to the insulated conductor.

3482. The method of claim 3460, further comprising monitoring a leakage current of the insulated conductor.

3483. The method of claim 3460, further comprising monitoring the applied electrical current.

3484. The method of claim 3460, further comprising monitoring a voltage applied to the insulated conductor.

3485. The method of claim 3460, further comprising monitoring a temperature in the insulated conductor with at least one thermocouple.

3486. The method of claim 3460, further comprising electrically coupling a lead-in conductor to the insulated conductor, wherein the lead-in conductor comprises a low resistance conductor configured to generate substantially no heat.

3487. The method of claim 3460, further comprising electrically coupling a lead-in conductor to the insulated conductor using a cold pin transition conductor.

3488. The method of claim 3460, further comprising electrically coupling a lead-in conductor to the insulated conductor using a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3489. The method of claim 3460, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation.

3490. The method of claim 3460, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing comprises steel.

3491. The method of claim 3460, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the overburden casing is further disposed in cement.

3492. The method of claim 3460, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein a packing material is disposed at a junction of the overburden casing and the opening.

3493. The method of claim 3460, further comprising coupling an overburden casing to the opening, wherein the overburden casing is disposed in an overburden of the formation, and wherein the method further comprises inhibiting a flow of fluid between the opening and the overburden casing with a packing material.

3494. The method of claim 3460, further comprising heating at least the portion of the formation to substantially pyrolyze at least some hydrocarbons within the formation.

3495. A system configured to heat a coal formation, comprising:

at least three insulated conductors disposed within an opening in the formation, wherein at least the three insulated conductors are electrically coupled in a 3-phase Y configuration, and wherein at least the three insulated conductors are configured to provide heat to at least a portion of the formation during use; and

wherein the system is configured to allow heat to transfer from at least the three insulated conductors to a selected section of the formation during use.

3496. The system of claim 3495, wherein at least the three insulated conductors are further configured to generate heat during application of an electrical current to at least the three insulated conductors during use.

3497. The system of claim 3495, further comprising a support member, wherein the support member is configured to support at least the three insulated conductors.

3498. The system of claim 3495, further comprising a support member and a centralizer, wherein the support member is configured to support at least the three insulated conductors, and wherein the centralizer is configured to maintain a location of at least the three insulated conductors on the support member.

3499. The system of claim 3495, wherein the opening comprises a diameter of at least approximately 5 cm.

3500. The system of claim 3495, further comprising at least one lead-in conductor coupled to at least the three insulated conductors, wherein at least the one lead-in conductor comprises a low resistance conductor configured to generate substantially no heat.

3501. The system of claim 3495, further comprising at least one lead-in conductor coupled to at least the three insulated conductors, wherein at least the one lead-in conductor comprises a rubber insulated conductor.

3502. The system of claim 3495, further comprising at least one lead-in conductor coupled to at least the three insulated conductors, wherein at least the one lead-in conductor comprises a copper wire.

3503. The system of claim 3495, further comprising at least one lead-in conductor coupled to at least the three insulated conductors with a cold pin transition conductor.

3504. The system of claim 3495, further comprising at least one lead-in conductor coupled to at least the three insulated conductors with a cold pin transition conductor, wherein the cold pin transition conductor comprises a substantially low resistance insulated conductor.

3505. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath.

3506. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the conductor comprises a copper-nickel alloy.

3507. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 7 % nickel by weight to approximately 12 % nickel by weight.

3508. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, wherein the conductor comprises a copper-nickel alloy, and wherein the copper-nickel alloy comprises approximately 2 % nickel by weight to approximately 6 % nickel by weight.

3509. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises a thermally conductive material.

3510. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises magnesium oxide.

3511. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, and wherein the magnesium oxide comprises a thickness of at least approximately 1 mm.

3512. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the electrically insulating material comprises aluminum oxide and magnesium oxide.

3513. The system of claim 3495, wherein the insulated conductor comprises a conductor disposed in an electrically insulating material, wherein the electrically insulating material comprises magnesium oxide, wherein the magnesium oxide comprises grain particles, and wherein the grain particles are configured to occupy porous spaces within the magnesium oxide.

3514. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises a corrosion-resistant material.

3515. The system of claim 3495, wherein at least the three insulated conductors comprise a conductor disposed in an electrically insulating material, and wherein the electrically insulating material is disposed in a sheath, and wherein the sheath comprises stainless steel.

3516. The system of claim 3495, wherein at least the three insulated conductors are configured to generate radiant heat of approximately 500 W/m to approximately 1150 W/m of at least the three insulated conductors during use.

3517. The system of claim 3495, further comprising a support member configured to support at least the three insulated conductors, wherein the support member comprises orifices configured to provide fluid flow through the support member into the opening during use.

3518. The system of claim 3495, further comprising a support member configured to support at least the three insulated conductors, wherein the support member comprises